JANUARY, 1959

TOOLING & PRODUCTION

Magazine

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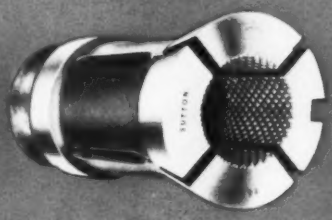

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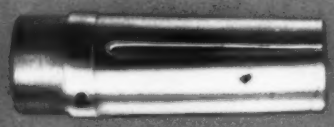

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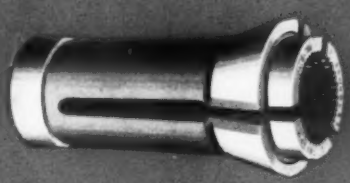

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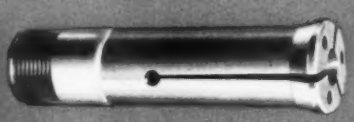

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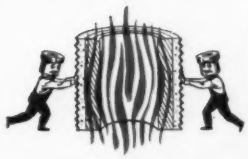

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TOOLING & PRODUCTION Magazine

JANUARY 1959
VOL. XXIV No. 10
GEORGE J. HUEBNER, Founder

PERSONALLY SPEAKING

Dear T & P Reader:

Does American industry have to be bombed out to be persuaded to modernize production facilities and equipment? I hope not. You probably have seen pictures of some of the beautiful new European plants. Or, if you haven't, perhaps you have read about them.

As you know, the War took a terrific toll of manufacturing facilities through bombing. Also, vast quantities of machinery were confiscated and shipped to Russia. So, European industry, and particularly West German industry, has mostly new plants virtually devoid of obsolescence. And don't forget also the large number of new plants established as a result of very aggressive efforts to industrialize Europe. Everything is new and modern in these plants.

If we are to compete successfully in world markets, and also in the U. S. market, this is the time for American industry to modernize its production facilities. And now is the time to do it because the builders of production machinery have ample capacity to furnish anything you want. If you wait a year or two years or three years, until the promised boom demand of the 60's is upon you, you'll pay more and you'll wait longer and you'll lose a competitive advantage which could be yours if you do something about it now.

If you think you can't afford to do it because of write-off rules of the Internal Revenue Department, don't take this for granted until you have checked. We know that American industry today is not benefiting nearly as much as it could from the greatly liberalized depreciation rules. You can find this out for yourself by getting a copy of Bulletin F from your local Internal Revenue or Department of Commerce office. Or, if this is inconvenient, drop me a line and I'll see if I can't get one for you.

Cordially yours,

Ray Huebner

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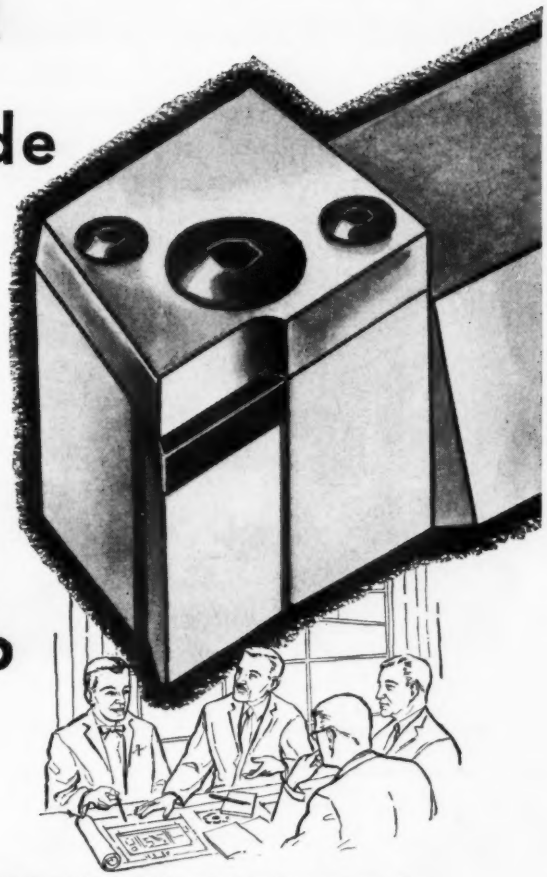

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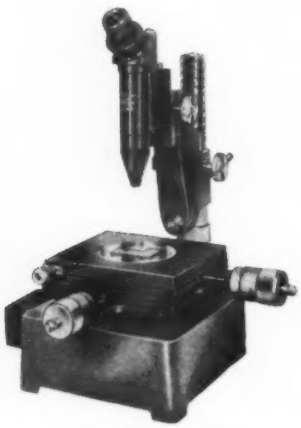

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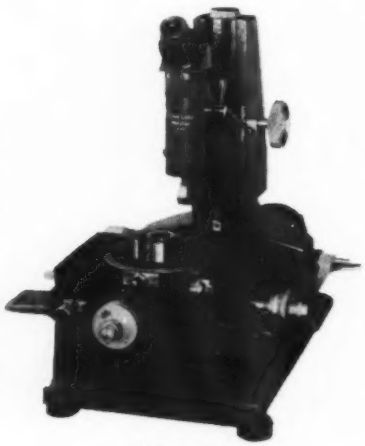

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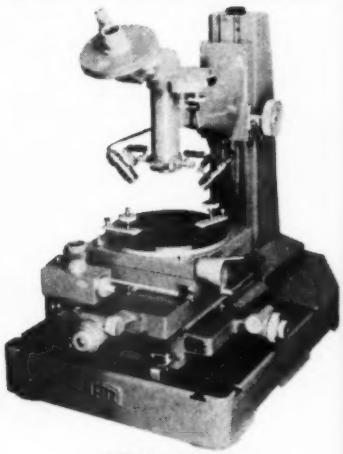

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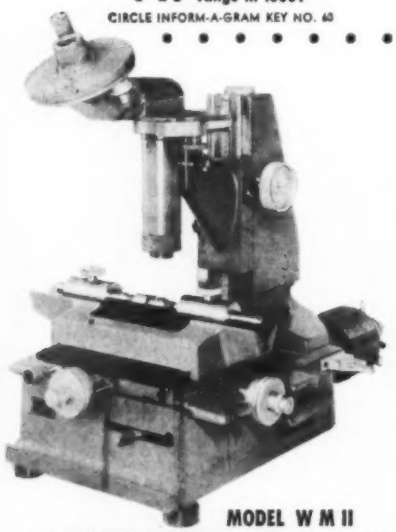

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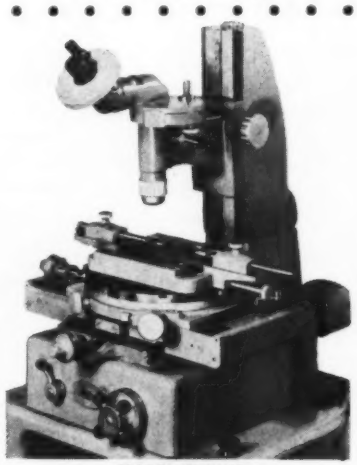

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Talk of the Month

EUROPE'S MACHINE TOOL INDUSTRIES

by Ludlow King
Executive Vice President
NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION
Cleveland, Ohio

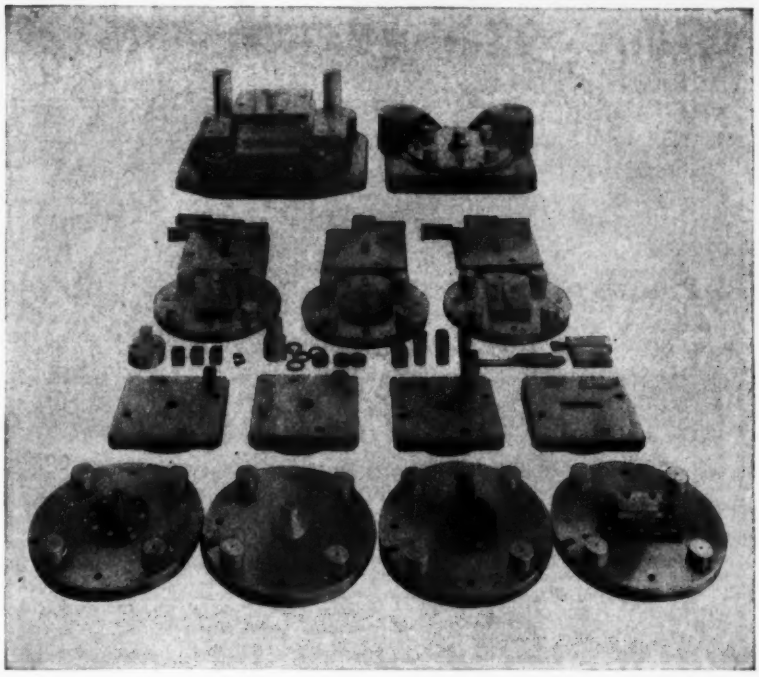
EUROPEAN MACHINE TOOL BUILDERS are extremely alarmed about a new threat — the growing political capabilities of the Russian machine tool industry!

At the invitation of the European Machine Tool Committee, Al Bodine, Ralph Kraut, Metz Hollengreen, and I met with them in Brussels on September 18, to learn of their deep concern. Representatives from England, Germany, Italy, France, Belgium, and Switzerland were present. Without going into full particulars, here are the salient points discussed:

1. Russia is making tremendous strides in increasing her production of machine tools. More specifically, they will produce approximately 140,000 machine tools in 1958 and expect to increase production to 200,000 units by 1960. The U.S.A. will produce only 34,000 machine tools in 1958.
2. They have over 1,000 engineers and technicians working full time on designing new, and better, machine tools.
3. Their quality and precision is rapidly improving and they are now building transfer lines as well as numerically-controlled machine tools.
4. They have helped China build very large machine tool plants which are equipped with Russian-built machine tools and staffed with Russian supervisors.
5. The European Committee is fearful Russia will start flood-

. . . **Continued on page 11**

Adapted from Mr. King's report before the Executive Session of the recent 57th Annual Meeting of the NMTBA, The Homestead, Hot Springs, Va.



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Progress Report on Anocut* Electrolytic Machining

For materials that are hard
. . . like carbides and hardened tool steels.

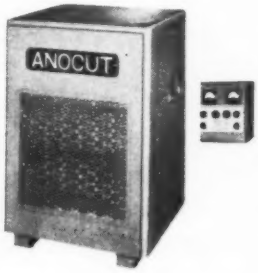
For materials that are tough and stringy, causing burring
. . . like stainless steel.

For materials that are heat sensitive, that tend to check, crack and lose important metallurgical properties in conventional grinding
. . . like die steels and aircraft super alloys.

Anocut anodic cutting (electrolytic and electrochemical machining are other names for the same thing) offers important advantages.

- Faster removal of many materials.
- No heat damage, checking or cracking.
- Fragile parts machined without burning, burring or distortion.
- Abrasive costs reduced 80%-90%.
- High tensile strength materials machined without burring.
- Laminated materials machined without smear or layover.
- Excellent finish.
- Accuracy of precision grinding.

A front interior view of **Model 300** showing placement of power components, fuse cut-outs, control chassis and relay panel.



Model 150, shown with control box for remote mounting.

Model 1500. For production work requiring as much as 1500 amperes.

Model 600. Model designation corresponds with ampere output capacity.

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The Anocut electrolytic machining process, first introduced by Anocut three years ago, has not only proven itself in industrial service (over 50 per cent of all Anocut installations are the result of repeat orders for additional units) but the process has been vastly improved and broadened in application. Examples:

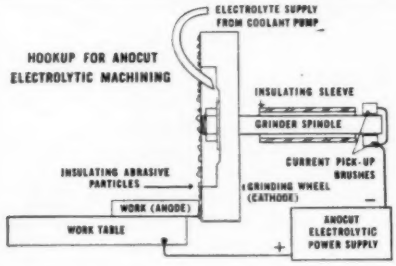
- Removal rate on steel cutting grades of carbide has been increased from .030" per minute to **.110" per minute** (½"x ½" slug).
- Hardened high speed steel can now be machined at **.360" per minute** (see opposite page) without burning or loss of temper.
- Form grinding wheels (non-diamond) are now available and can be dressed to form with a diamond point (see opposite page).

These results are not achieved by magic or wild claims of something for nothing but by conscientious adherence to the established principle that electrolytic metal removed is directly proportional to the electric current which can be passed through the electrolyte (conductive water base coolant) between the wheel and the work (Faraday's law). Continuing research on electrolytes, wheels and techniques of application has increased current carrying capacity and has resulted in tremendous progress in the three years since Anocut was introduced.

Leading machine tool manufacturers have given Anocut experienced friendly assistance, and now offer machines factory-made for Anocut electrolytic machining. Leading abrasive manufacturers have vastly improved metal bonded wheels, diamond and non-diamond, for Anocut electrolytic machining.

Anocut, whose sole business is the manufacture of electrolytic power supply units and electrolyte solutions and the engineering of applications for this potent new metal removal procedure stands ready to explore a broad range of machining problems which might benefit from its application. Anocut equipment will not be recommended except where it will prove of real advantage to the user.

For further information call any of the leading manufacturers of machine tools (see list on opposite page). Fill out the coupon on the opposite page.

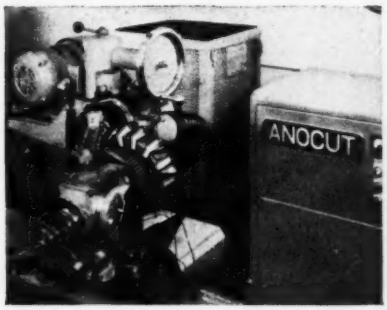


Electrolytic removal may be considered as the reverse of electroplating. The workpiece is made the anode in the circuit. The metal bonded abrasive grinding wheel is made the cathode. The two are spaced apart by the protrusion of abrasive particles (spacers) from the surface of the wheel. An electrolyte fluid flows across the surface of the wheel passing the current between the workpiece and the metal wheel. The automatically controlled direct current supplied by the Anocut unit causes the anode (workpiece) to dissolve as the abrasive particles of the wheel maintain size and finish. The amount of metal removal is directly proportional to the amount of current flow, in accordance with Faraday's law.

*The electrolytic grinding process, pioneered by Anocut, is covered by U.S. Patent No. 2,826,540. Others pending.

Some Good Applications for... Anocut Electrolytic Machining

Thompson #3 Surface Grinder connected to Anocut Model 300 for grinding solid carbide inserts at Cooperative Carbide Grinding Co., Anderson, Indiana. Diamond wheel costs for this work have been reduced 90 per cent.



Gallmeyer & Livingston #60 Universal Grinder. Note brush assembly on work spindle. Face-type wheel is used with tooth plunged to depth. Once around and cutter is finished. Indexing time reduced by 90 per cent.

SCE-6 machine manufactured by Hammond Machinery Builders specifically for use with Anocut electrolytic equipment. See inset of ground tool. Entire installation paid out in six months.

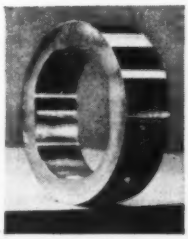


Fig. 1

Fig. 2

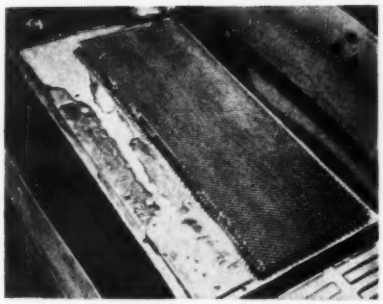


Fig. 3

Fig. 1—An example of grinding very hard tool steel. Internal cam form ground electrolytically, maintaining very tight tolerances and increasing production rate 300 per cent.

Fig. 2—Fir-tree form electrolytically ground in root of jet engine blade with non-diamond form wheel. Fifty blades (100 sides) ground with no loss of form. Speckled appearance results from exposure of crystal structure, visual proof of lack of abrasion or smear.

Fig. 3—Panel of stainless steel honeycomb, surfaced electrolytically. Surface must be burr-free for brazing to stainless steel sheet "skin." Thickness of ribbon is only .001 and any abrasion will cause layover and burr.

Fig. 4—A Detroit Gear Grinding machine was used for grinding this aircraft gear, using a formed non-diamond wheel. The complete gear (32 teeth) was ground without loss of tolerance, which is .0001". Approximately .004" removed from the flanks, .007" at the root in six seconds per tooth. Previous high rejection rate caused by checking, cracking and inaccuracy of form substantially reduced.

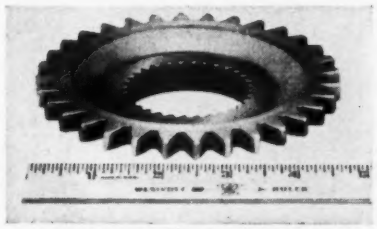


Fig. 4

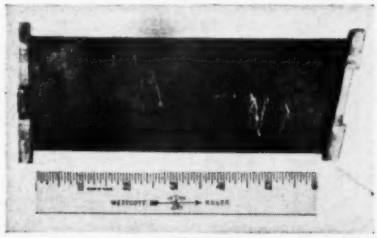


Fig. 5

Fig. 5—End platforms covered with hardface material ground on this jet engine vane using split-wheel set-up on Gallmeyer & Livingston surface grinder with Anocut Model 600. Grinding time reduced from 188 seconds to 37 seconds, with problems of heat-checking eliminated

Fig. 6

Fig. 6—T-15 steel, hardened to 65 Rockwell C, 166 seconds to remove 1".

Most of the major machine tool builders now offer their equipment with the necessary insulation and spindle brushes to permit ready application to electrolytic machining. Among these are the following:

Abrasive Machine Tool Co.
The Blanchard Machine Co.
Besly-Welles Corporation
Brown & Sharpe Manufacturing Co.
Cincinnati Milling & Grinding Machines, Inc.
Covel Manufacturing Co.
DeVlieg Machine Co.
Ex-Cell-O Corporation
Frauenthal Division
Gallmeyer & Livingston Co.
Gardner Machine Compnay
Hammond Machinery Builders, Inc.
Mattison Machine Works
Norton Company
Onsrud Machine Works
Pope Machinery Corporation
Reid Brothers Co., Inc.
The Standard Electrical Tool Co.
The Thompson Grinder Company

ANOCUT ENGINEERING COMPANY
631 West Washington Blvd.
Chicago 6, Illinois

Please send me information on the following:

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Name_____

Address_____

City_____ State_____

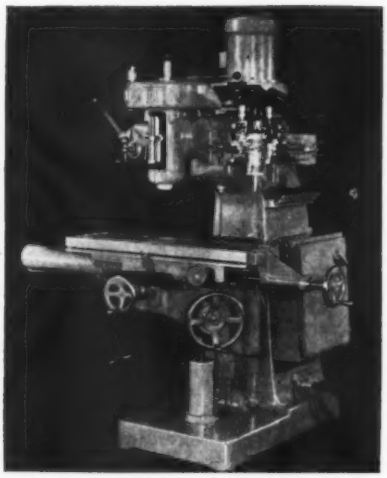
CIRCLE INFORM-A-GRAM KEY NO. 9

INCREDIBLE? NO!

THESE SAVINGS ARE REAL

GORTON MACHINE TOOLS,

both standard and custom-designed, are today *paying for themselves in record time. Here are just three typical examples:



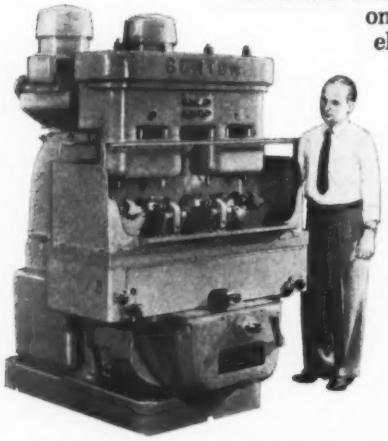
from 8 Hours per piece to 5 Minutes per piece

This standard Gorton Trace-Master Hydraulic Duplicator was purchased to profile a complex part from a simple master. Previous cost of this operation was $102.40. Present cost with this Gorton machine is $1.07. Saving per piece is $101.33.

*Cost figures were arrived at by using $2.80 per hour for operator's time and $10.00 per hour, Machine rate.

cost saving per piece . . . $1,139.20

This Gorton Horizontal Mill with special holding fixture, tooling, hydraulics, etc., was purchased to machine thirty-five impeller blades from the solid, involving compound curvatures, thicknesses and depths. Former production time was one piece in 100 hours. Present time on this new machine is one piece in eleven hours. Machine was paid for after machining 22 pieces.



$50,000 machine pays for itself in 41 Weeks

This Gorton 4-spindle "Automatic Cycle" Duplicator was purchased to mill out recesses in a round steel part. Original production time on a manually operated single spindle duplicator was 60 pieces per hour. Present production on this new machine is 204 pieces per hour. Cost saving is 71%.

Cost reduction and improved accuracy are important to you today. We shall be glad to analyze your needs and make specific recommendations on request.

Your letterhead inquiry will receive prompt attention.

GORTON

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GEORGE GORTON MACHINE CO.

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Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

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CIRCLE INFORM-A-GRAM KEY NO. 10

. . . Months Talk from page 7

ing the world with machine tools to cripple the Free World machine tool industries and thus stifle the self-sufficiency of these countries. Through her satellite countries, Russia has already started selling machine tools in South America and a few in European countries at prices one-third to one-half below the European-produced machine tools.

6. Russia's tremendous advantage is her ability to sell in capitalistic markets, for capitalistic currency, machine tools which are produced with Communistic labor, or slave labor, where costs do not establish the selling price. Their sale will be a political instrument of deterioration and destruction — it will be a means to an end; the end of strong machine tool industries of the Free World. The motive will not be to develop wholesome, friendly trade with foreign countries, but to disrupt trade relationships of Free World nations.

7. How can capitalism prevent serious damage from this new Communistic weapon? The members of the European Committee do not know. No preventative measures were offered or discussed. The purpose of the meeting was for the European Committee to alert us to the new danger of Russia and her satellites.

Our Board of Directors has agreed to meet further with the European Machine Tool Committee — annually, alternating between Europe and the United States as meeting sites. They feel that such cooperation might prove beneficial to our own industry.

The new Russian threat might give our friends a keener insight as to how we feel when they raid segments of our domestic markets, and why we plan to do everything possible to protect our industry in its entirety.

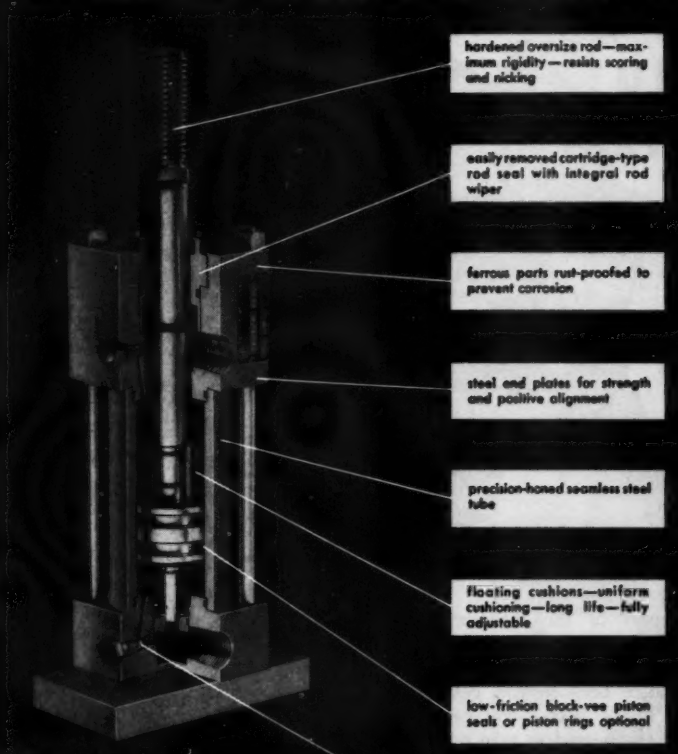
Personal Impressions by Country

While in Europe, Al Bodine and I visited England, Italy, Germany, Switzerland, France, Belgium, and Holland. In general, their machine tool businesses are "off" 20% to 25%, but their economies are much stronger, and their futures far more promising than many of us had realized.

England, with her 45-million population, appeared to be enjoying better conditions — possessing a strong-

for performance...
dependability...
economy... specify SP

HEAVY DUTY AIR and HYDRAULIC CYLINDERS


hardened oversize rod—maximum rigidity—resists scoring and nicking
easily removed cartridge-type rod seal with integral rod wiper
ferrous parts rust-proofed to prevent corrosion
steel end plates for strength and positive alignment
precision-honed seamless steel tube
floating cushions—uniform cushioning—long life—fully adjustable
low-friction block-vee piston seals or piston rings optional
springless ball checks for faster action

Rated 200 psi air or 1,000 psi hydraulic—interchangeable air or hydraulic without modification—built to JIC standards—specified by automotive manufacturers—conforms to Ford and Chrysler standards.

If your service requirements are severe . . . if you need uniform operation, long trouble-free life, minimum equipment downtime . . . you need S-P heavy-duty air and hydraulic cylinders!

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NON-ROTATING AIR AND HYDRAULIC CYLINDERS • ROTATING AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • COLLET AND DRILL PRESS CHUCKS • VALVES, ACCESSORIES

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CIRCLE INFORM-A-GRAM KEY NO. 11

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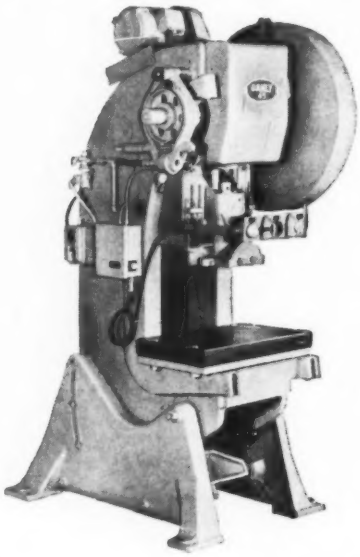
in PRESSES



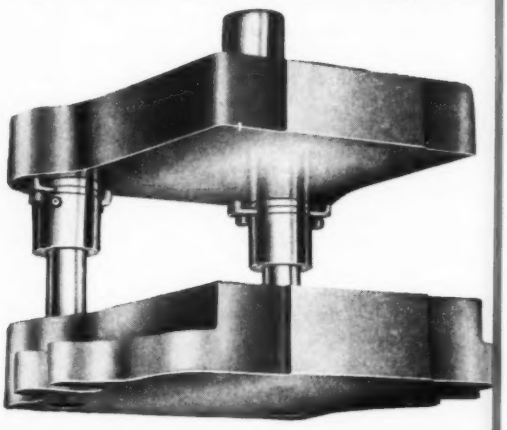
The report of the Business and Defense Service Administration shows that Danly led all producers of presses during 1957. Industry made Danly the first choice because you get lower operating costs with a Danly Press—you can depend on it! Each press is engineered to turn out more accurate stampings . . . to produce more units per shift . . . and to reduce profit-eating maintenance and spare parts inventories.

There are many new developments you should know about, such as the Quick Die Change feature available on all Straight Side Presses . . . single, double and triple action . . . the modern high-production Autofeeds . . . and the completely modern line of Open Back Inclinable presses just introduced. See how Danly can help you reduce costs and give your products the stamp of leadership!

Shown above: *New Danly O.B.I. Press.* Each model of this new press line (25 to 200 tons) has the exclusive Danly Air Clutch and Brake to assure continuous production and long press life.

Write for new O.B.I. Press catalog that gives complete information on features and specifications of these reasonably priced presses.

in DIE SETS and Die Makers' Supplies



Danly is now working on its fifth million in die set production. Included in this production are many die sets for the automotive industry—that are working in that industry in its multi-million car production of today.

In every instance, Danly can meet your most exacting diemaking specifications with a die set—standard or special. Since pioneering the first mass-produced precision die sets 36 years ago, Danly has continuously developed new production, inspection and distribution methods to serve you better.

Today, there's the new Danly Die Set with Demountable Bushings being assembled in a factory branch or distributor assembly plant near you. It is your fast, convenient source for toolroom and pressroom supplies that bear the stamp of leadership. Danly facilities for special Die Set manufacture are also improved and expanded.

Shown above: *New Danly Demountable Bushing Die Set*—the most accurate Die Set on the market today. The ease of assembly and disassembly offers important advantages in die making and die maintenance.

Send for money-saving facts. Write us and your distributor or branch will give you helpful information on Danly Die Sets.

DANLY MACHINE SPECIALTIES, INC. DANLY 2100 S. Laramie Avenue, Chicago 50, Illinois

. . . Month's Talk from page 11

er government and having far more to offer her younger generations than she did two years ago. Her machine tool production will amount to about $220-million in 1958. She exports approximately 30%. If England's domestic requirements amount to more than 70% of her own production, she prefers to import in order to reserve the 30% for her export markets, so she won't lose them.

The industrious West German people have won the war that Hitler lost! About 53-million strong, they have, in 12 short years since the end of the war, literally dug themselves out of a bomb-damaged rubble and become the financial center of all Europe.

I understand Stuttgart is a typical example of West Germany's recovery. U. S. General James Wilson, now stationed just outside of Stuttgart, told us that the first time he saw that city during the war it was just five feet high. It was so completely demolished that there were no streets or paths through the city. Today it is completely rebuilt into a thriving new city of about 600,000 population.

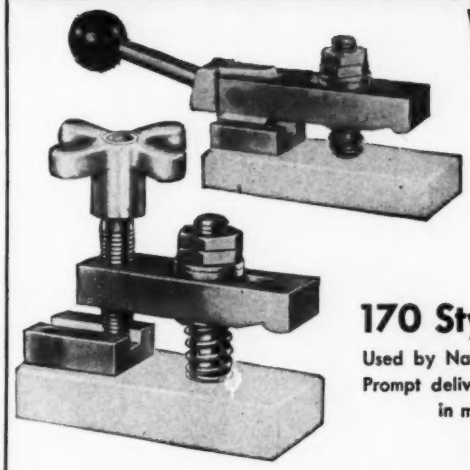
Al Bodine and I stopped at the Graf Zeppelin, which is a beautiful modern hotel with excellent food and service. Just across the street is a magnificent railroad terminal. Nearby are modern stores and office buildings. The people looked healthy and happy, the stores were filled with quantities of quality merchandise and food, and the number of automobiles caused the same traffic and parking problems as here in the United States. From one spot near the hotel we could see five large cranes in various directions, each busy in the construction of a new multi-story building. The city is a tremendous monument to the German's capacity for work, and to his ingenuity and diligence. They have their eyes on their goal, their feet on the ground, and are moving fast! There is no unemployment problem in Germany.

Germany Well Advanced

The German machine tool industry is well advanced in the new technologies. I saw one set of electronic controls which had three separate phases. On the first you could set all of the feeds and speeds required for a complete cycle. By switching on another electronic brain, it remembered all of the operations and would repeat the same on subsequent cycles. Then, by switching on a third machine, it re-

. . . Continued on page 16

The Right Clamp–
The Right Part
for EVERY
Work Holding Job



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INDEX PLUNGER

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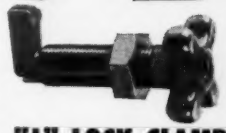
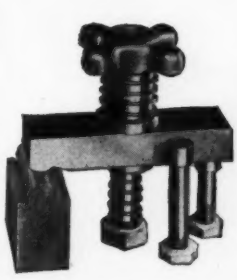
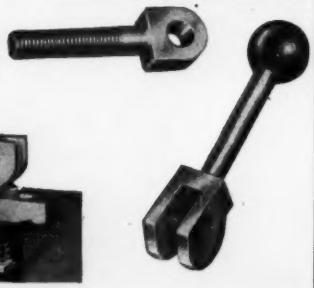

"L" LOCK CLAMP





FELLOWS MADE THE FIRST GEAR SHAPER CUTTER

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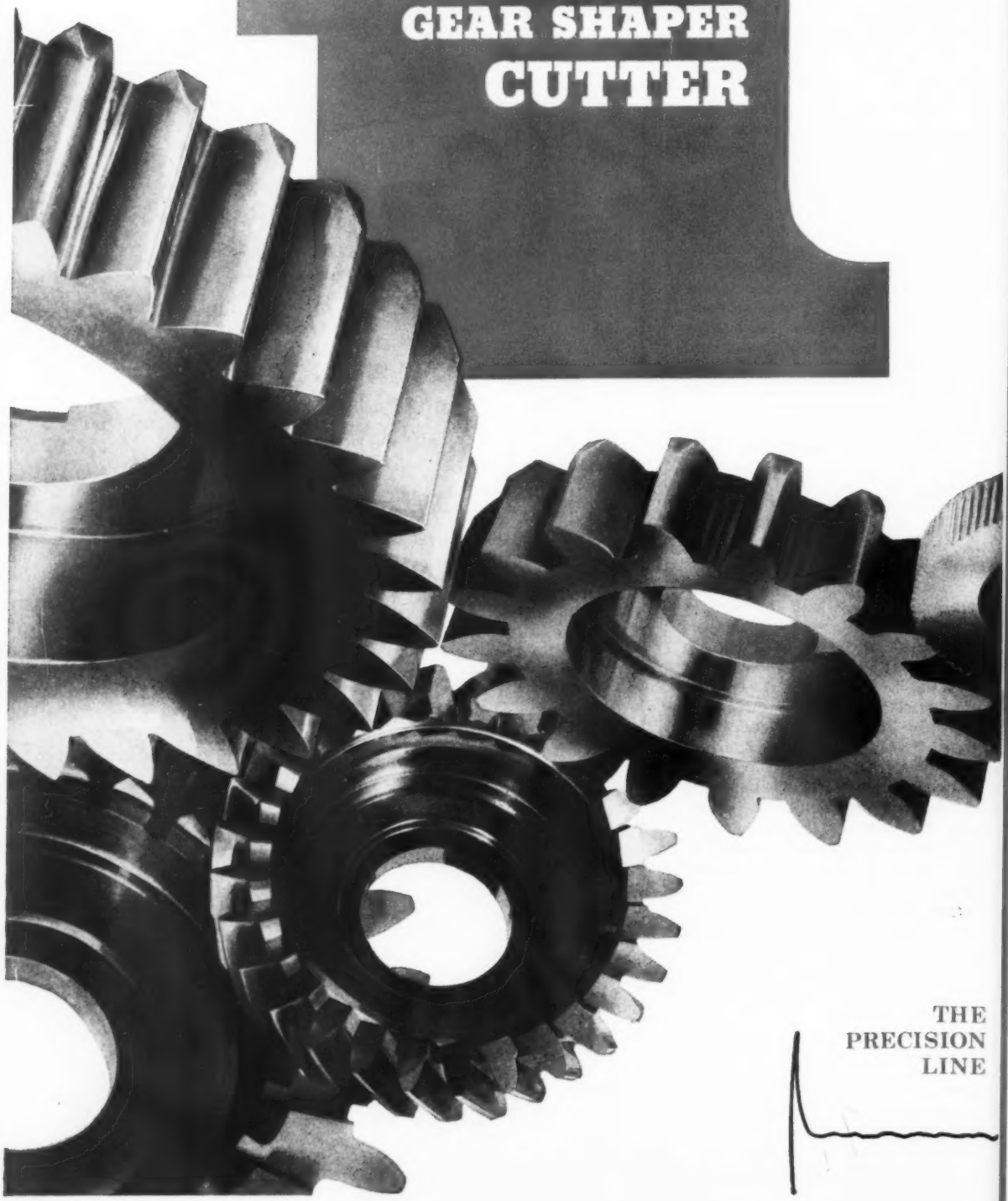

THE PRECISION LINE

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The Fellows Cutters you order today have unequalled experience behind their manufacture: the first gear shaper cutter ever made was designed, produced and patented by Fellows in 1897. Hundreds of thousands of Fellows Cutters have been made and used on gear production lines since that time.

This vast experience has resulted in constant progress, year after year, in cutter design and manufacture. Today, new gear and cutter designs are checked on a high-speed electronic computer which permits complete mathematical study of all possibilities. Constant advances in metallurgy and in manufacturing methods assure outstanding cutter performance on every gear production job.

A booklet, "Fellows Gear Shaper Cutters", covers the subject in detail. It includes tables of stock cutters, design considerations, sharpening methods, and other information. For a copy, contact any Fellows office.

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the DIXI 75

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- Projected optical setting—direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference.
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PLUS...

- Automatic positioning device available.
- Simplified controls functionally arranged for greater operating speed and efficiency.
- Hydraulic feeds and infinitely variable spindle speeds.
- Rear support optional.

(Made in Switzerland. Measurement in inches)

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York. — Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the horizontal optical jig borer.

We will welcome requests for a demonstration of the DIXI 75!

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CIRCLE INFORM-A-GRAM KEY NO. 16

. . . Month's Talk from page 13

corded all of the operations on a teletype tape. So, by the time the first workpiece was finished, the tape would be completed and ready to teletype to some distant plant, which could insert it in another machine and start producing the identical workpiece.

During the present year West Germany will surpass us as the Free World's leading producer of machine tools. Germany exports about 50% of its production. It expects to produce $420-million worth of machine tools this year. Since they sell at about one-third less than the same machines produced here, the corresponding dollar value would be $630-million. This should be compared to our probable total shipments of both cutting type and forming type amounting to $480-million. In other words, with one-third of our population, their production will exceed our own by 31% in 1958 — or, on a per capita basis, they are out-producing us four to one.

Italy's 50-million have completely overcome Mussolini's costly dreams of imperialism. Their economy is twice as good as it was before World War II. Milan is the production "heart" of its economic body, while the Eternal City of Rome and other fascinating points of interest in that beautiful country attract terrific sums in dollars, pounds, marks, etc., from many millions of tourists each year. The machine tool production will amount to about $60-million in 1958.

At first a "bicycle-economy" following the War, it is now passing through a "motorbike-and-scooter-economy." We were told the "scooter" manufacturers are starting to tool-up for the production of automobiles as the country is rising to a new, higher level—the "small car-economy." Of course Fiat is now mass-producing cars, and there are many cars and trucks on the roads of Italy. No serious unemployment problems exist except in the agricultural section of southern Italy, where there are several million without work.

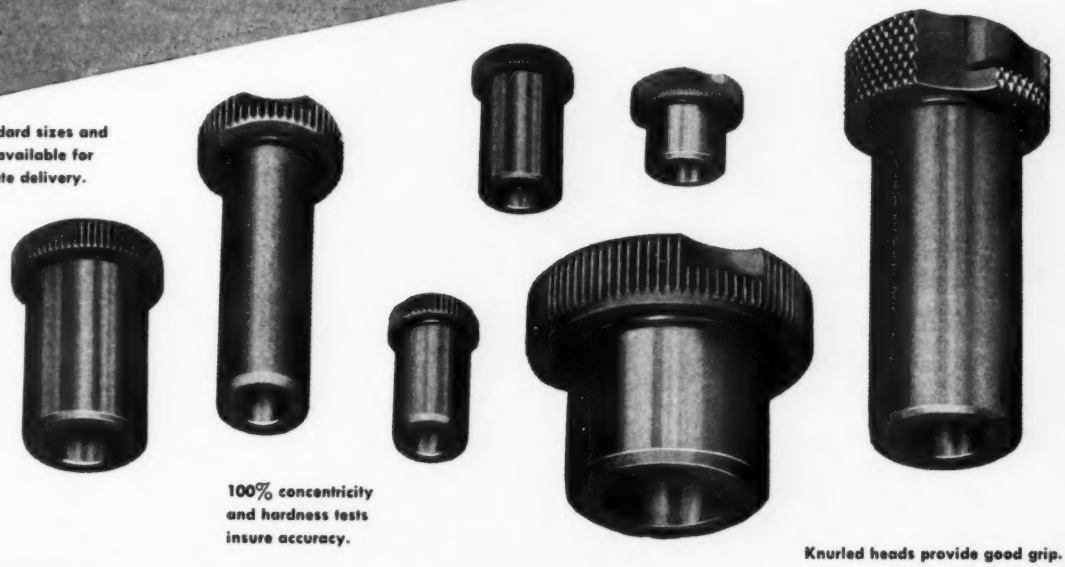
Common Market Will Build Fast

With regard to the prospects facing European countries, I'm inclined to believe that they have a most promising future. Not only will they establish a Common Market quicker than many people think, but I believe within two generations the national boundaries and national antagonisms will become far less ap-

. . . Continued on page 18

UNIVERSAL DRILL BUSHINGS
industry's standard of quality and service

All standard sizes and lengths available for immediate delivery.

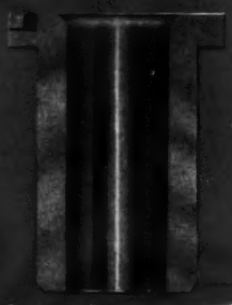


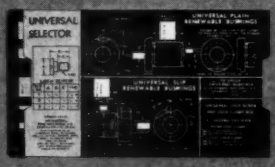
100% concentricity and hardness tests insure accuracy.

Knurled heads provide good grip.

Write for free catalog describing Standard Drill Bushings, Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, Kwik-Switch Tool Holders, Mikro-Lok Boring Bars, Index Plungers and other Universal Products.

...superfinishing of Universal Drill Bushings is an important factor in keeping tool and bushing wear to a minimum ... especially in close tolerance work. Blended radius helps prevent tool hang-up.





The Universal Drill Bushing Slide Chart gives accurate engineering data for the selection of all types and sizes of drill jig bushings up to 1⅜" drill size. Request your calculator—free—on your company letterhead.

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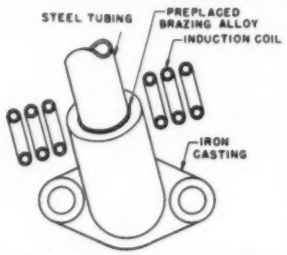
If you are interested in induction heating you are invited to send samples of the work with specifications. Our engineers will process and return the completed job with full data and recommendations without any cost or obligations.

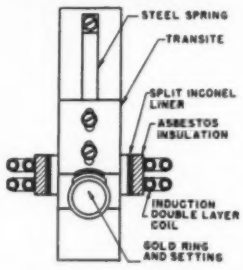
TYPICAL INDUCTION HEATING APPLICATIONS

IRON CASTINGS BRAZED TO STEEL TUBES



Assembly of iron castings and steel or copper parts are facilitated by induction heating. Arrangement is illustrated for silver brazing malleable iron castings to steel tubing. Coil design shown provides uniform heating for joint. Proper joint design assures high bond strength. Electrolytic treatment of castings to remove carbon (Kolene Treatment increases strength and tightness of joint to gases and liquids.

GOLD BRAZING IN JEWELRY INDUSTRY



Liner type induction coil shown provides a flexible arrangement for brazing settings to gold rings. The simple fixture facilitates handling. The unique coil design permits heating by induction and by radiation from heated metal liner. Ring, setting and gold brazing alloy are pre-assembled in a ceramic jig and then moved into heating position within the coil for brazing.

CUTTER BLADES SELECTIVELY HARDENED

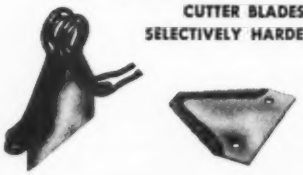


Photo shows coil design and arrangement used to selectively harden edges of cutter blades used in agricultural equipment. In production, cutter blades are automatically fed between layers of the induction coil, selectively heated and then oil quenched at the rate of one per second. Hardness at the cutting edge is Rc 62/64. Distortion is negligible.

Electronic Tube Generators from 1 kw to 100 kw.
Spark Gap Converters from 2 kw to 30 kw.

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CIRCLE INFORM-A-GRAM KEY NO. 18

. . . Month's Talk from page 16

parent — there will be much freer movement of people, similar monetary systems will be established, and we will see the formation of what will constitute, for economic purposes, a United States of Europe. They have everything to gain in the long-run, with only temporary losses during the amalgamation. I further believe this new Union will enjoy an expansion period in economy, production, and standard of living comparable to that which the U.S.A. has experienced since the Depression Period of the '30s.

In summation: The combined populations of England, Germany, and Italy are less than the U.S.A. Yet, in 1958 these three countries will produce over a billion dollars worth of machine tools, (adjusted to U.S.A. prices) as against our $480-million — a ratio greater than two to one. Their export business alone, which will amount to $450-million (again adjusted to U.S.A. prices), approaches our entire production. However, they still want a greater share of our home market. Typical of their thinking is an article which appeared in a London newspaper. It quotes Lord Trefgarne of W. E. Sykes, Ltd., as follows:

> "Expenditure on technological developments and efforts to increase our business on the American continent constitute the main foundations on which the future expansion of the business depends, and we continue to make substantial expenditure in these fields. A strengthening of our selling organization in the United States will be undertaken as warranted by prospects of business. Sales of our machines to some leading manufacturers in the U.S.A. encourage us to expect a good result there.
>
> "Since the circulation of my statement to the shareholders, we have noticed with interest the continued efforts of the National Machine Tool Builders' Association to obtain an increase in the tariff against imported machine tools."

In the face of such low-wage competition, the health of our machine tool industry is dependent upon two major factors: Our ability to out-design, out-service, and out-sell cheap labor countries, and our Government's interest in maintaining a strong machine tool industry. The superiority of U.S. builders' in-

. . . Continued on page 25

*a machine that harnesses the **full** potenti*

Kearney & Trecke

KTNC MILWAUKEE-

a flexible automated machining center that unifies m

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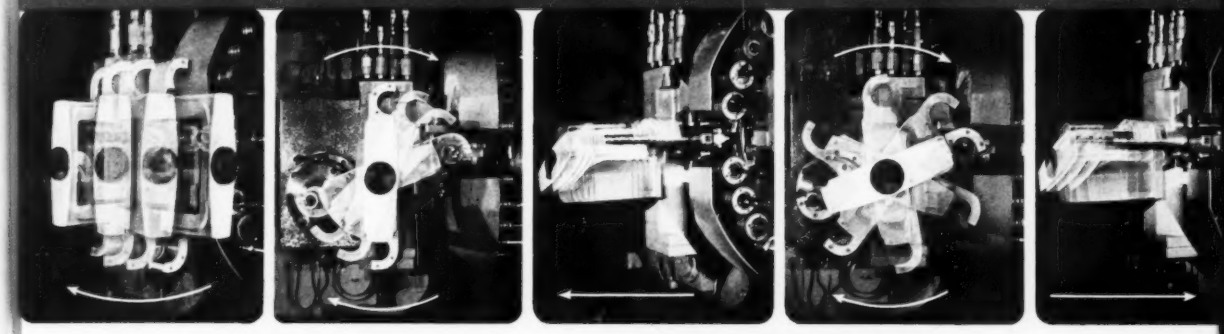
Here it is! KTNC AUTOMATIC TOOL CHANGER IN



In a matter of seconds this exclusive **MILWAUKEE-MATIC** *feature changes your production schedules from* ***MONTHS TO MINUTES!***

Here's what MILWAUKEE-MATIC means to your operations

The MILWAUKEE-MATIC is the *most significant achievement* of the machine tool industry in the last 50 years. Briefly, it is a single machine that performs the many operations that are normally accomplished on several other machines to complete a part. MILWAUKEE-MATIC will improve almost every aspect of administrative planning—from plant management and finance to engineering and production.

- **Offers flexible automation for job-lot producers through numerically controlled positioning, straight-line milling, arcs and slopes, tool selection, indexing and speeds and feeds.**
- **Cuts working capital requirements... balances inventory.**
- **Boosts machine cutting time by as much as 75% by applying off-machine workpiece set-up.**
- **Slashes tooling cost... savings can pay for MILWAUKEE-MATIC in one to three years.**
- **Reduces lead time from months to days... permits rapid new product introductions and product changes.**

KEARNEY & TRECKER MILWAUKEE®

KEARNEY & TRECKER CORPORATION, Dept. KTNC
6800 W. National Ave., Milwaukee 14, Wisconsin

Designers and Builders of Precision and Production Machine Tools Since 1898

*he **full** potential of numerical control:*

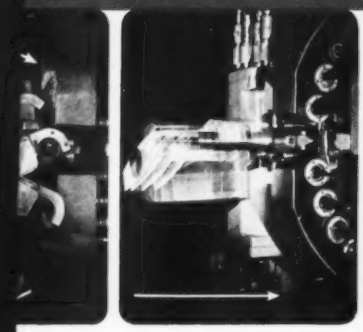
***& Trecker** Tape-Controlled*

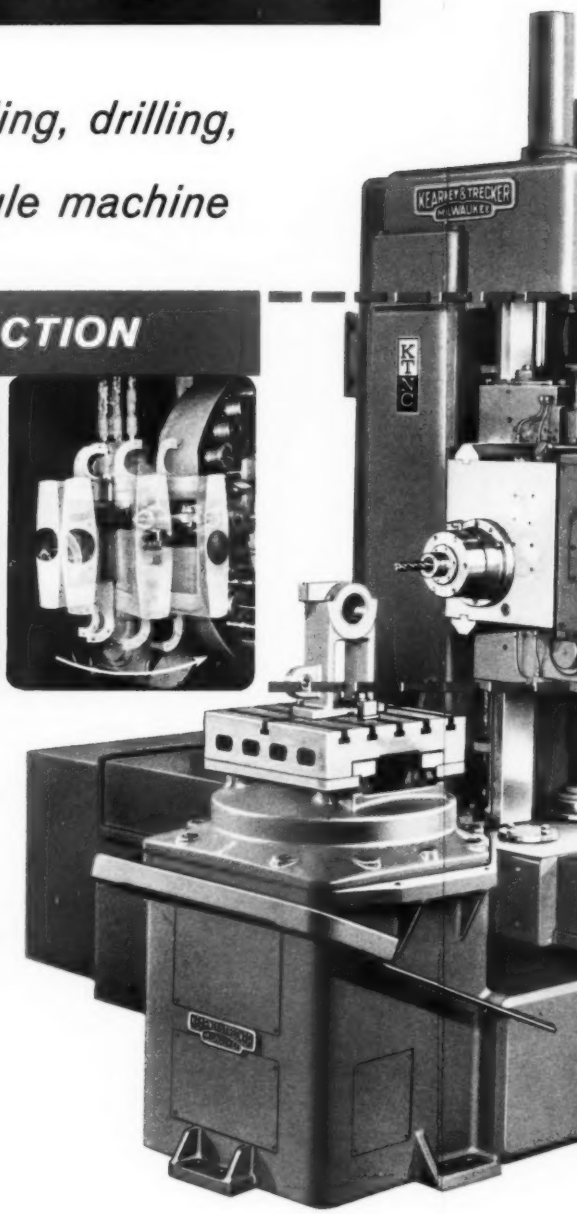
KEE-MATIC

that unifies milling, drilling,

erations in a single machine

CHANGER IN ACTION





feature

S TO MINUTES!

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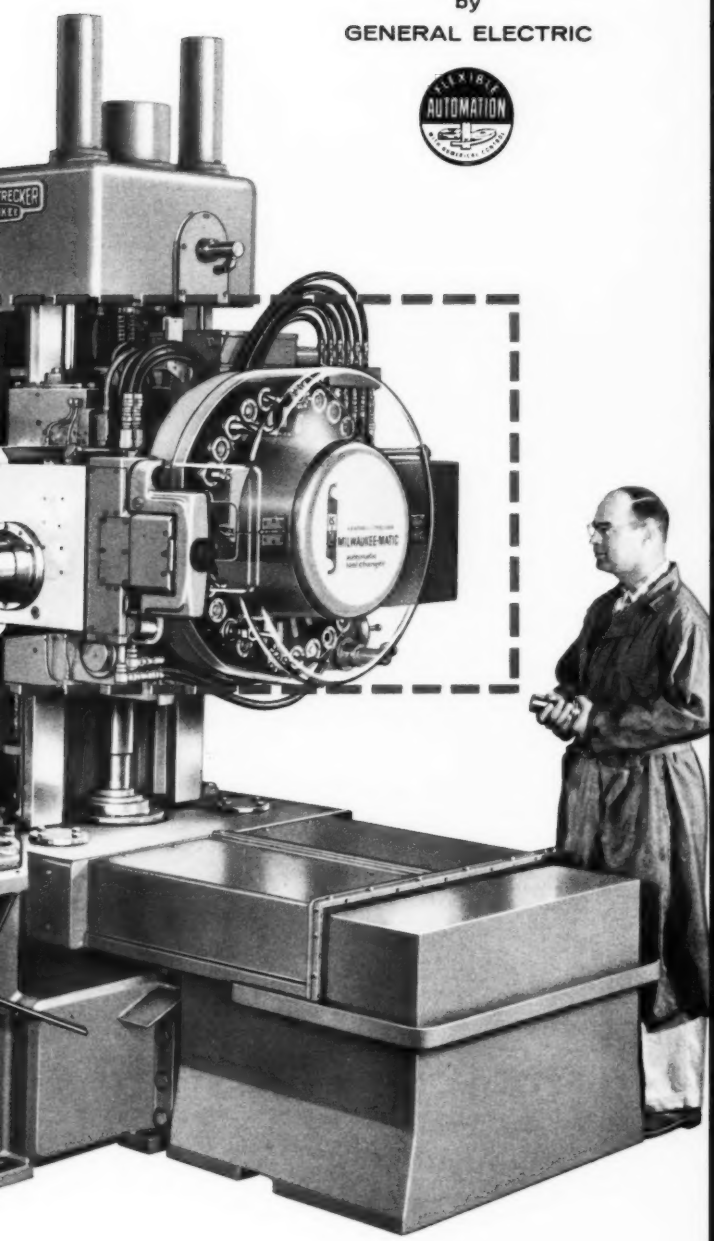
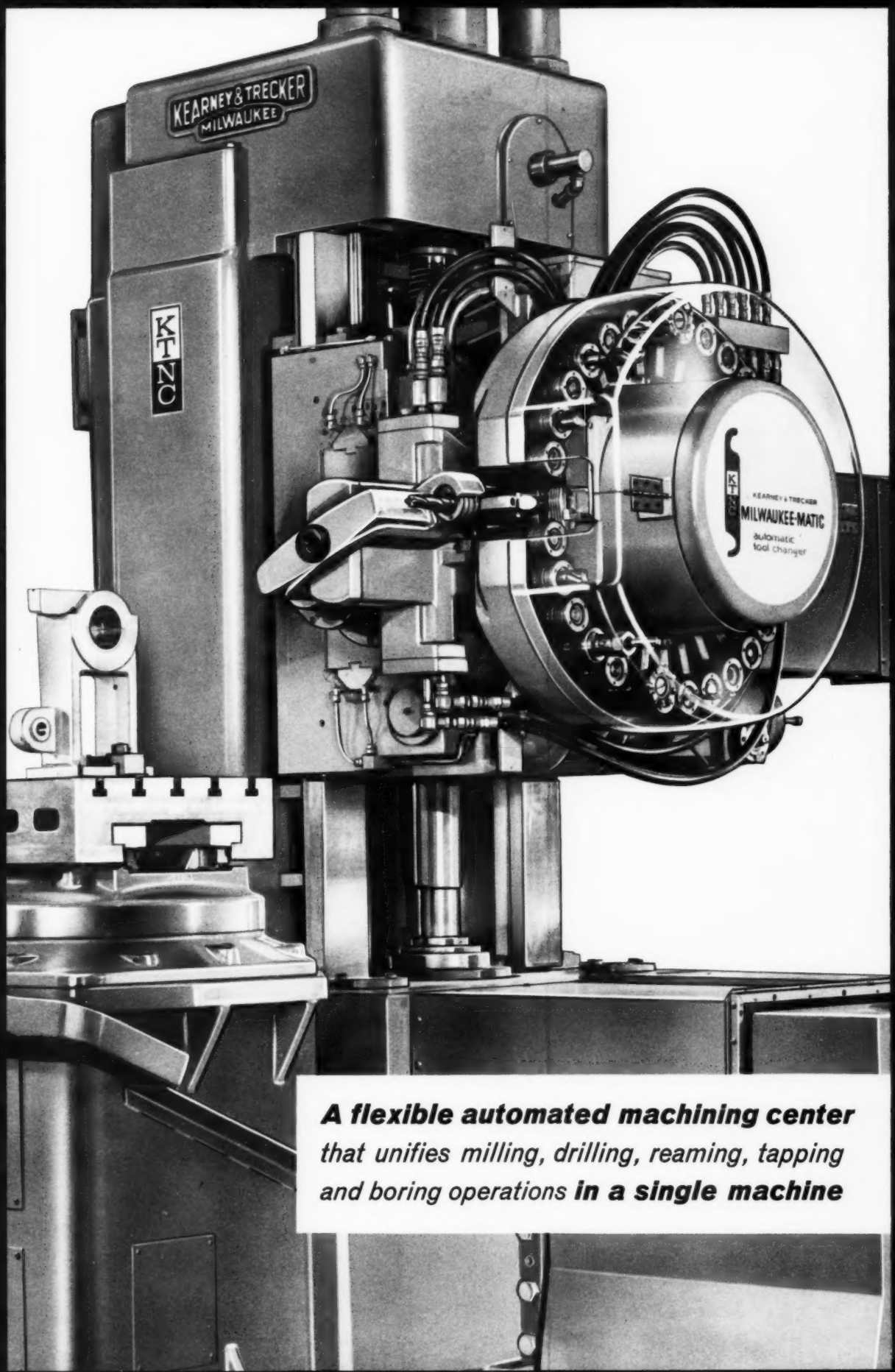
TION, Dept. KTNC
14, Wisconsin

ion Machine Tools Since 1898

Program Controls
by
GENERAL ELECTRIC



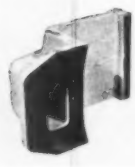
See Back Page...
FOR FANTASTIC SAVINGS!



A flexible automated machining center *that unifies milling, drilling, reaming, tapping and boring operations* ***in a single machine***

KEARNEY & TRECKER
MILWAUKEE
®

How MILWAUKEE-MATIC *saved* *$1637.89* on tooling costs alone compared to conventional machining methods

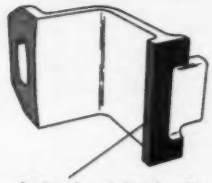


Motor bracket.

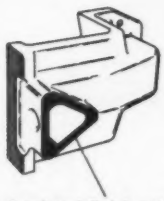
DESCRIPTION	CONVENTIONAL	MILWAUKEE-MATIC
Cycle time	38.7 min.	15.37 min.
Set-up time	4.62 hrs.	.25 hrs.
Tooling	$1894.00	$256.11
Savings on tooling costs alone . . .		$1637.89

® Trademark Reg. U.S. Pat. Off.

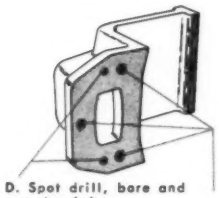
A. Rough and finish mill two surfaces. Time, 2.51 min.



B. Rough and finish mill one surface. Time, 1.36 min.



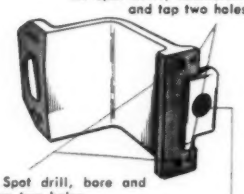
C. Rough and finish mill one surface. Time, .89 min.



D. Spot drill, bore and ream two holes.

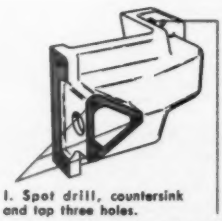
E. Spot drill and drill 3 holes. Time, 3.42 min.

G. Spot drill, countersink and tap two holes.



F. Spot drill, bore and ream two holes.

H. Spot drill, drill and bore one hole. Time, 4.19 min.



I. Spot drill, countersink and tap three holes.

J. Counterbore three holes (in back.) Time, 3.00 min.

Only one single holding fixture and one set-up required to perform 49 operations described above.

CONTACT THESE MILWAUKEE-MATIC SALES REPRESENTATIVES

ATLANTA, GA.
Scott Machine Tool Co.
411 Williams St., N.W.

BENTON HARBOR, MICH.
Jackson-Fotsch Co.
P. O. Box 356

BIRMINGHAM, ALA.
George M. Meriwether Inc.
1712 Seventh Ave., North

BOSTON, MASS.
Stedfast & Roulston, Inc.
11 Deerfield St.

BUFFALO, N. Y.
Syracuse Supply Company
1965 Sheridan Drive

CHARLESTON, W. VA.
Wm. S. Belden Co., Inc.
MacCorkle Ave.

CHATTANOOGA, TENN.
Scott Machine Tool Co.
116 Dauphin Way

CHICAGO, ILL.
Jackson-Fotsch Co.
7350 West Lawrence Ave.

CINCINNATI, O.
The E. A. Kinsey Co.
327-335 W. Fourth St.

CLEVELAND, O.
Kearney & Trecker Corp.
Euclid Ave. & E. 17th St.

COLUMBUS, O.
The E. A. Kinsey Co.
1020 W. Fifth St.

DALLAS, TEX.
Greene Machinery Co.
6300 Wyche Blvd.

DAYTON, O.
The E. A. Kinsey Co.
16 Washington St.

DENVER, COLO.
F. J. Leonard Co.
1219 California St.

DETROIT, MICH.
Kearney & Trecker Corp.
10600 Puritan Ave.

GREENSBORO, N. C.
Smith-Courtney Co.
814-820 Winston St.

HICKORY, N. C.
Smith Courtney Co.
103 3rd Street, S.W.

HOUSTON, TEX.
Steel & Machine Tool Sales
6414 Navigation Blvd.

INDIANAPOLIS, IND.
The E. A. Kinsey Co.
1550 Stadium Drive

JACKSONVILLE, FLORIDA
Scott Machine Tool Co.
1111 Legay Avenue

KANSAS CITY, MO.
Blackmon & Nuetzel Machinery Co.
1103 E. Armour Blvd.

LOS ANGELES, CALIF.
Moore Machinery Co.
3200 S. Garfield Ave.

MILWAUKEE, WIS.
Kearney & Trecker Corp.
6800 W. National Ave.

MOLINE, ILL.
Jackson-Fotsch Co.
2920 25th Ave. "A"

NEW YORK, N. Y.
Kearney & Trecker Corp.
409 Grand Ave.
Englewood, New Jersey

NEW ORLEANS, LA.
Steuss & Hess, Inc.
524 Camp St.

OMAHA, NEB.
Fuchs Mach. & Supply Co.
2401 N. Eleventh St.

PHILADELPHIA, PENN.
Kearney & Trecker Corp.
Suburban Square Bldg.
Ardmore, Penna.

PHOENIX, ARIZ.
Moore Machinery Co.
45 W. 1st Ave.,
Scottsdale, Ariz.

PITTSBURGH, PENN.
Kearney & Trecker Corp.
4 West Manilla Ave.

PORTLAND, ORE.
Harry M. Euler Co.
2811 N.E. Glisan St.

RICHMOND, VA.
Smith-Courtney Co.
Seventh & Bainbridge Streets

ROCHESTER, N. Y.
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Sales Service Mach. Tool Co.
2363 University Ave.

SALT LAKE CITY, UTAH
Todd Machinery Co.
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White Star Machinery Co.
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6800 W. National Avenue, Milwaukee 14, Wisconsin

I would like to make the following MILWAUKEE-MATIC arrangements:

- ☐ Have Kearney & Trecker representative call me for MILWAUKEE-MATIC film demonstration appointment.
- ☐ Send me new MILWAUKEE-MATIC Bulletin.
- ☐ Send me schedule of MILWAUKEE-MATIC Workshop dates.

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Mail coupon

for MILWAUKEE-MATIC demonstrations . . .

Attend private Workshop Sessions at Kearney & Trecker in Milwaukee

See Milwaukee-Matic film demonstration in your plant or at your nearest Kearney & Trecker distributor's office

COMPARE! *(at our expense)*

the NEW Rotor J-40 Air Impact Wrench

3/8" Capacity

"TOPS THEM ALL IN PERFORMANCE AND HANDLING," says large auto assembly plant.

"TORQUES IN 4 SECONDS COMPARED TO 8 SECONDS FOR OTHER WRENCHES," says appliance manufacturer.

Compare the New Rotor J-40 Air Impact Wrench for:

TIME SAVING. Delivers 1800 solid blows per minute.

POWER. Fast rundown, high ultimate tightness. ⅜" bolt capacity.

EASY USE. Weighs 4¼ lbs. Only 6¾" long.

LOW MAINTENANCE. Only two impacting members. Interchangeable end plates and bearings. No gears.

FIND OUT HOW you can cut *your* assembly costs with this faster, more powerful, more maintenance-free J-40. Mail coupon today.

ROTOR TOOLS
CLEVELAND, OHIO

ROTOR AIR TOOLS: Assembly Tools • Drills • Small Wheel Grinders • Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
ROTOR HIGH-CYCLE ELECTRIC TOOLS: Grinders • Polishers • Sanders

The Rotor Tool Company
26300 Lakeland Boulevard
Cleveland 32, Ohio

☐ Please demonstrate the new Rotor J-40 in our shop.
☐ Send literature and quotation.

Company Name_____
Company Address_____
Your Name_____
Position_____
City_____ Zone____ State_____

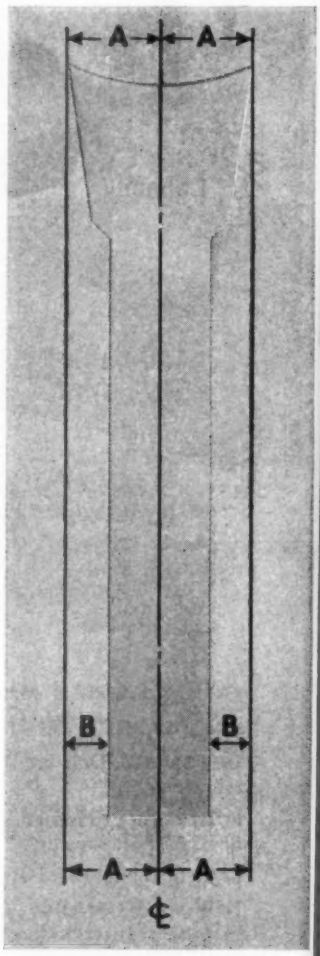
CIRCLE INFORM-A-GRAM KEY NO. 23

CLEVELAND *Improved* MO-MAX® GROUND T-SHAPED CUT-OFF BLADES

can REDUCE YOUR COSTS on all types of cutting-off, grooving and finning operations

MO-MAX High Speed Steel, carefully heat treated by the most modern methods and equipment, provides superior cutting qualities . . . produces *more cuts per grind.*

MO-MAX COBALT High Speed Steel gives best results under difficult conditions . . . has a high degree of red hardness.



The head and body of every blade are ground to close tolerances with reference to the center line, resulting in accurate uniformity and interchangeability.

A new method of grinding these T-shaped Cut-off Blades assures extremely high accuracy in all dimensions. Head and body are always equidistant from the center line. This provides complete interchangeability, and saves costly set-up time.

The top of each blade is ground with a radius, so that the chips are crimped. Chips are narrower than the blade itself, resulting in a cooler running tool, less scoring on the sides of the cut and easier application of coolant.

Try MO-MAX or MO-MAX COBALT T-shaped Cut-off Blades on *your* next job and see how their superior performance reduces your costs. Contact our nearest stockroom or . . .

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

for CLEVELAND Quality Tools . . . *prompt delivery from stock*

THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58

CIRCLE INFORM-A-GRAM KEY NO. 24

. . . Month's Talk from page 18

genuity, creativeness, and technology has pulled the industry through difficult circumstances before, and we are sure the new machine tools exhibited at the 1960 Machine Tool Exposition will attest that those three characteristics of our industry still prevail.

METAL STITCHER SPEEDS ASSEMBLY

When Amana Refrigeration Inc. changed their method of assembling aluminum sections of freezer liners from metal screws to metal stitching, the assembly operation was performed 12 times faster.

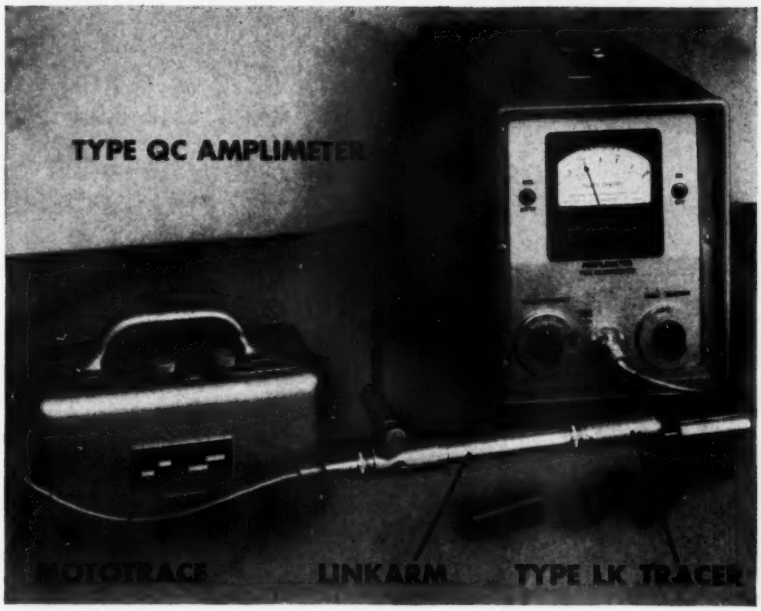
It previously took 12 min to assemble a liner; now the production rate is one liner a minute. On the liner shown in the illustration, 25 screws would have been used. By changing to metal stitching with #18 round wire, the same holding power is achieved and the material cost is reduced to one-half the price of screws. The machine used is an Acme-Morrison metal stitcher.

SWAGING MACHINE USED IN PRECISION WORK

Precision attachment of ball fittings to automobile parking brake cables is successfully done with the Fenn Hydroformer. The machine, built by The Fenn Manufacturing Co., uses a spindle mechanism which allows wide opening of the dies to permit swaging between shoulders, which sometimes is referred to as internal or central reduction.

The spindle mechanism carries a pair of hydraulically - actuated wedges which impart a controlled closing action to the dies. The wedges, in the fully advanced position, fill the spaces between the hammers and the dies. In the retracted position, they permit the dies to open wide enough for the insertion of a ball, or other shape for swaging.

NEW! Profilometer® GROUP III



Measures Roughness of Surfaces from ⅛" to Flat — ID and OD

THIS shop equipment handles an exceptionally wide range of roughness measurement—with *proven Profilometer accuracy.* It is lightweight and portable — built for use by shop personnel — and includes the following items:

NEW Type LK Tracer — Measures on ID's and OD's as small as ⅛" — flats — tapers — narrow splines — gear teeth. Passes through a ¾" hole.

NEW Type QC Amplimeter — Shows roughness from 0 to 1000 microinches (arithmetical or r.m.s.) on an easy-to-read meter. Has 3 standard roughness width cutoffs. Factory-calibrated for dependability.

Mototrace and Linkarm — Give the Tracer a steady support and smooth motion, essential to dependable measurement. No operator skill required.

FREE LITERATURE gives details. Write for it. And, without obligation, let us arrange for a demonstration in your plant. We have representatives in principal industrial centers throughout the Free World.

Remember: You can DEPEND on the PROFILOMETER — first in surface roughness measurement since 1936.

Profilometer is a registered trade-mark.

MMC® MICROMETRICAL MANUFACTURING COMPANY

339 S. MAIN ST. ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 25

HARDINGE
ELMIRA, N.Y.

MASTERS and PADS

FOR BETTER PERFORMANCE — BETTER PRODUCTION

AND

PROFITS

STYLE "S"
MASTER COLLETS and PADS
The Only Master Collet with
No Work Pressure On The Screw
Available For: Cleveland-Cone
Greenlee—Gridley and Acme-Gridley
National Acme—New Britain
Warner & Swasey

Write for *FREE* Bulletins

STYLE "B"
MASTER FEED FINGERS and PADS
Pads Cannot Work Loose
No Screws — No Pins
Available For: Brown & Sharpe
Cleveland—Cone—Davenport—Greenlee
Gridley and Acme-Gridley—National Acme
New Britain—Warner & Swasey

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HARDINGE BROTHERS, INC., ELMIRA, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 26

Dan:
this may solve
our transmission
problems.
Suggest you
investigate O.K.

PRODUCTION MACHINERY
GREENLEE

- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines
- Core Box Rollover and Draw Machines

GREENLEE OFFERS . . .

COOPERATION FOR AUTOMATIC PRODUCTION

The emphasis is on cooperation at Greenlee. Your ideas are added to Greenlee's. One idea sparks another. The result . . . the creation of machines that will meet your requirements efficiently . . . economically . . . now and in the future. Top-flight Greenlee engineers help you avoid costly mistakes. Their thinking is sound . . . respected. Call Greenlee. Let them give you the complete story on cooperation for automatic production.

MACHINES DESIGNED WITH THE FUTURE IN MIND

GREENLEE BROS. & CO.

1746 MASON AVENUE
ROCKFORD, ILLINOIS

Joe: these people have a lot of machines in Detroit
Look them over and let me have your reaction - Sam

FOR THE DIEMAKER WHO HAS EVERYTHING...

. . . everything but a good source for die sets,
here's a suggestion.
Die sets are basic to mass production.
They don't need
gadgets, gimmicks or glamorous-styling.
Production depends on
sound design, quality materials, accuracy
and reliability, and
at reasonable cost and delivery time.
That's the way it is
with Detroit die sets. Why don't you
try them today.

Detroit Die Set builds and stocks over 2,000 different die sets plus specials of all types. Ask for new catalog without obligation.

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DIE SET
CORPORATION

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CIRCLE INFORM-A-GRAM KEY NO. 28

At Pipe Machinery...

Times Change, But Never Ideals

Quality, Precision and Service Are Still Our Watchwords

There's a world of difference between that simple one-room frame building where William G. Benninghoff started The Pipe Machinery Company in 1912 and our present spacious, well-equipped plant.

Yet, some things at Pipe Machinery don't change. We have never lost sight of the basic ideals of quality, precision and service which were the watchwords of our founder forty-six years ago. Today, every man and woman in our Gage Division is dedicated to the ideals of Mr. Benninghoff ...dedicated to the manufacturing of gages of unsurpassed accuracy and durability — and to their prompt delivery.

We invite you to get acquainted with our team of devoted craftsmen. Stop in and visit us next time you're in Cleveland.

THE PIPE MACHINERY COMPANY • 29100 Lakeland Blvd. • Wickliffe, Ohio • Greater Cleveland

CIRCLE INFORM-A-GRAM KEY NO. 29

FOR THE DIEMAKER WHO HAS EVERYTHING...

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That's the way it is
with Detroit die sets. Why don't you
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We invite you to get acquainted with our team of devoted craftsmen. Stop in and visit us next time you're in Cleveland.

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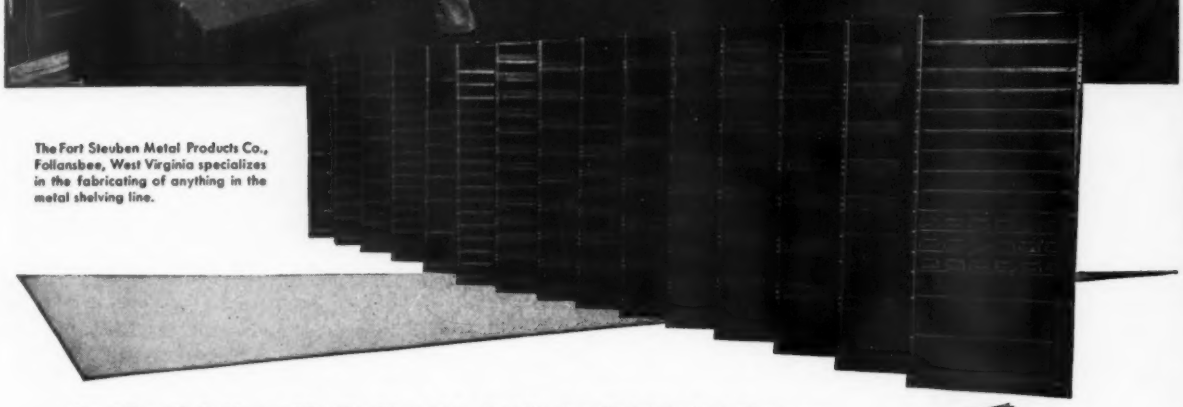
CIRCLE INFORM-A-GRAM KEY NO. 29

BATH PRESSES can TAKE IT... Around the Clock!

The Fort Steuben Metal Products Co., Follansbee, West Virginia specializes in the fabricating of anything in the metal shelving line.



Mr. Albert W. Robinson, Vice President of the Fort Steuben Metal Products Company has this to say about Bath Presses:

"Here at Fort Steuben we are more than satisfied with the way Cyril Bath Presses have demonstrated their ability to take it. Operating as we do, sometimes around the clock to keep up with demand for our shelving, we require dependable, rugged equipment. This ruggedness, coupled with large bed area for dollars expended, plus ease of operation and maintenance makes Cyril Bath Presses ideal."

Catalogs are available, without obligation, covering both The Cyril Bath Power Press Brake and P.T. Press line . . . this literature covers important information regarding the features which make BATH Presses your best buy . . . and ask for the Power Press Brake Die Catalog too!

THE CYRIL BATH COMPANY

32380 Aurora Road • Solon, Ohio

(LOCATED IN THE GREATER CLEVELAND AREA)

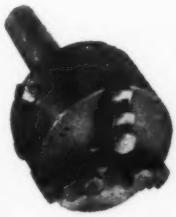
Manufacturers of Radial Draw Formers • Dies • Tools • Press Brakes • Tangent Bending Sequence Presses • Press Type Brakes • Special Machines

CIRCLE INFORM-A-GRAM KEY NO. 30

CHUCKS CAN BECOME OBSOLETE TOO!

retool with Cushman

air or manually operated chucks



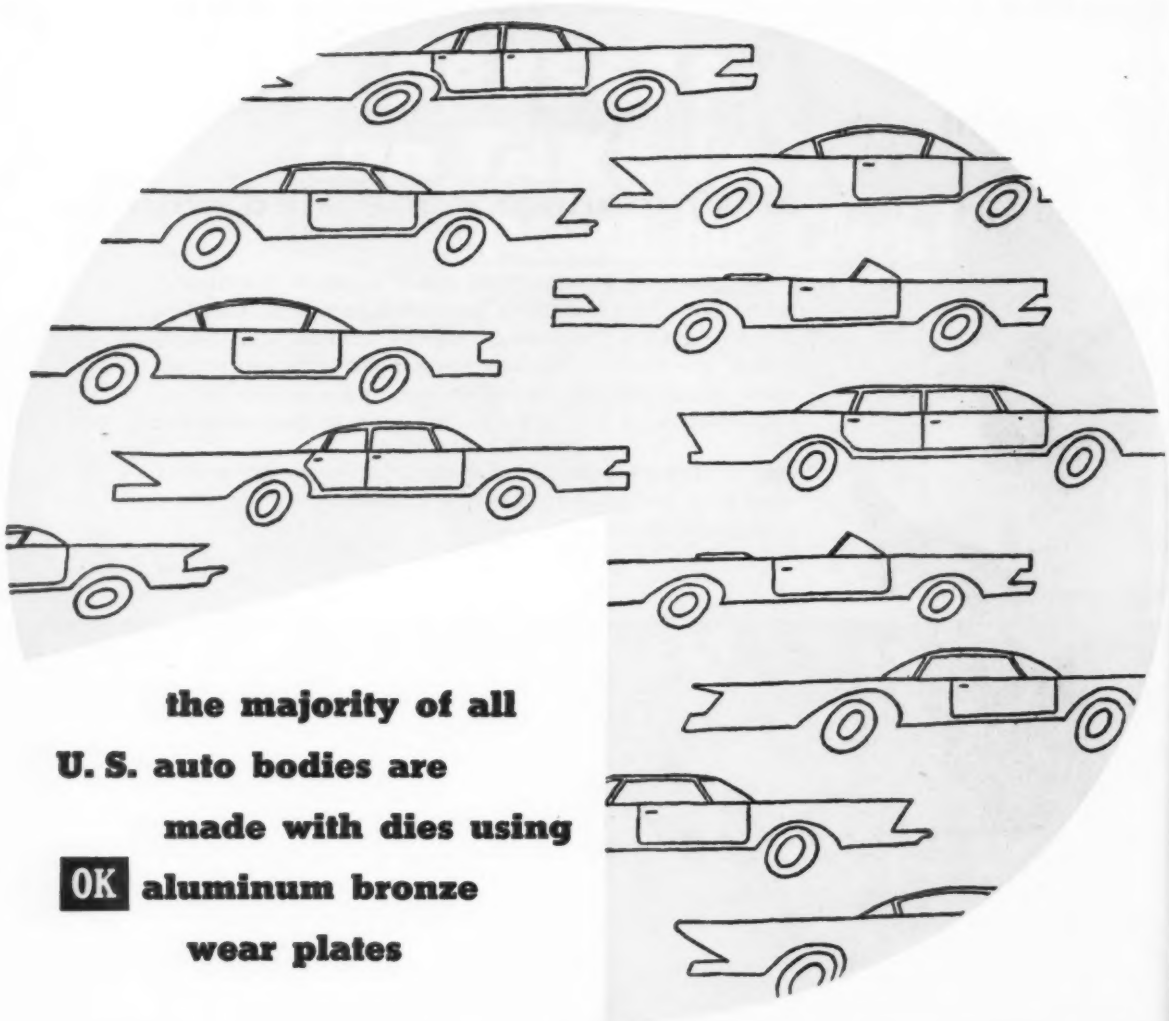
Designed and built to fully meet modern machining techniques and machine tool requirements, Cushman Chucks permit the use of higher speeds with heavier feeds, maintaining closer tolerances with continued repetitive accuracy and result in maximum workholding efficiency with the greatest savings in time and costs.

For profitable machining through the use of precision chucking equipment, specify Cushman Air or Manually Operated Chucks.

CUSHMAN CHUCKS,
a product of American quality,
labor and materials.

THE **CUSHMAN** CHUCK COMPANY • HARTFORD 2, CONN.

Sold through your industrial distributor



the majority of all U. S. auto bodies are made with dies using OK aluminum bronze wear plates

Here's why: You can save approximately 40% under the cost of expensive solid bronze wear plates . . . and you receive completely finished wear plates, available from stock, ground to ± .0005 parallel and flat. By a unique cladding process, long wearing aluminum bronze is bonded to a steel base, easily machinable for fitting to dies. Drilling or counterboring can be done through bronze surface if required. Wherever your die has a sliding or cam action, OK aluminum bronze wear plates, because of their great wearing qualities, assure longer die life.

Photo at right shows OK aluminum bronze wear plates in a body die at one of the world's largest automotive plants. Complete information is in our new OK Catalog. For your free copy, write Dept. 55-LL.

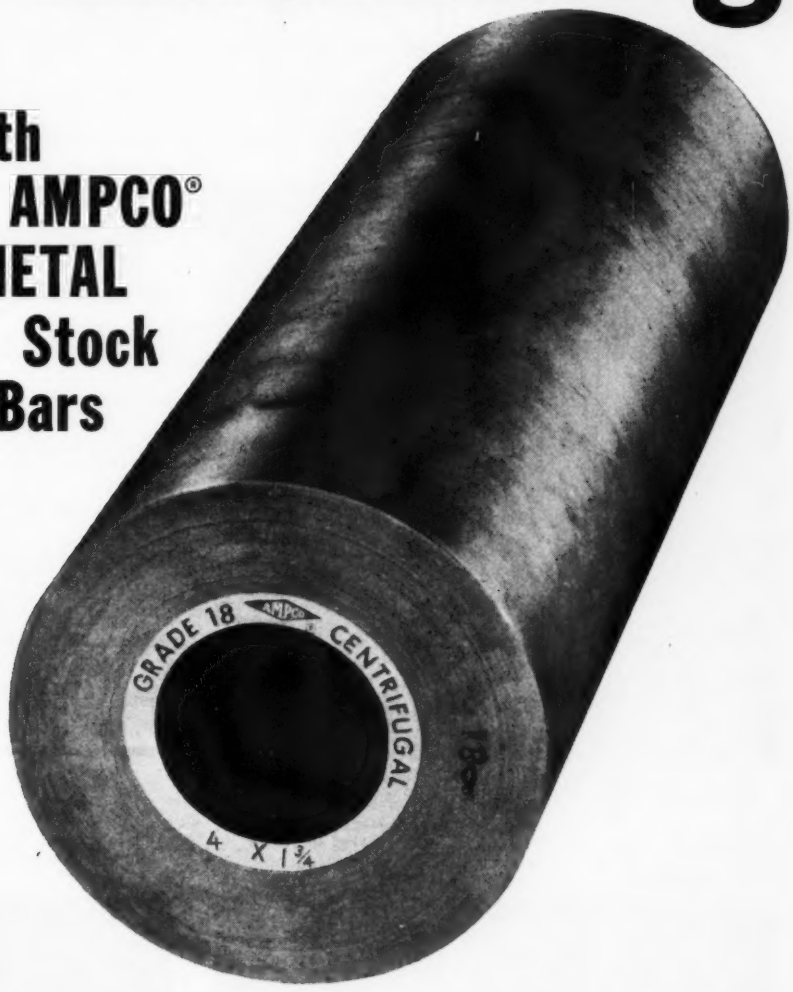
THE OHIO KNIFE CO.
CINCINNATI 23, OHIO

SLITTER KNIVES • SHEAR BLADES • BRONZE WAYS • WORK-REST BLADES • CUT-OFF BLADES • SCRAP CHOPPERS • HARDENED SPACERS • BALL RACES • HARDENED WAYS • WEAR STRIPS • GIBS

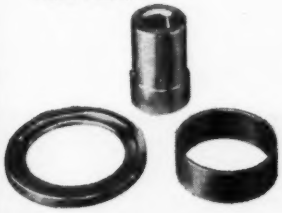
CIRCLE INFORM-A-GRAM KEY NO. 32

Save machining

with AMPCO® METAL Stock Bars



Typical bushings and bearings of Ampco Metal centrifugally-cast bars.



Only finish-machine cuts are needed on Ampco Metal Centrifugally Cast Stock Bars. They are semi-finish machined all over — finish allowance, 1/16" on O. D. and I. D.

Made of Ampco Metal Grade 18, a tough copper-base alloy that resists wear, shock, impact. Ideal for bearings, bushings, gears, and similar applications.

Your Ampco distributor has Ampco Metal Stock Bars in stock now — in 90 sizes up to 10" O. D. 12½" lengths. Call him for prompt delivery.

Ampco Metal, Inc., Dept. 54A, Milwaukee 46, Wis. West Coast plant: Burbank, Calif. — Southwest plant: Garland (Dallas County), Texas.

RM-11

AMPCO

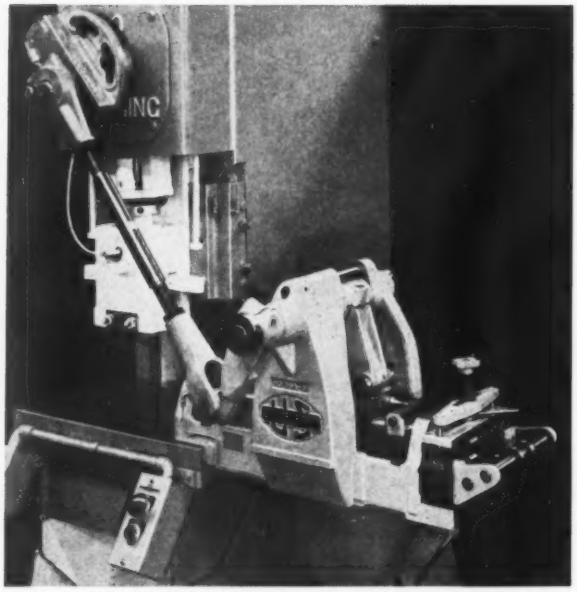
AMPCO®

CIRCLE INFORM-A-GRAM KEY NO. 33

Automatic Feeding for punch press profit!

Short run jobs—produced with long-run economy on the new U. S. SLIDE FEEDS.

NEW U. S. SLIDE FEED features reduce press room costs . . . increase production because . . .



Special S. F.-68A U. S. Slide Feed. Set-up for Feeding right to left on press with front to back crankshaft.

LESS TIME NEEDED FOR CHANGEOVER.

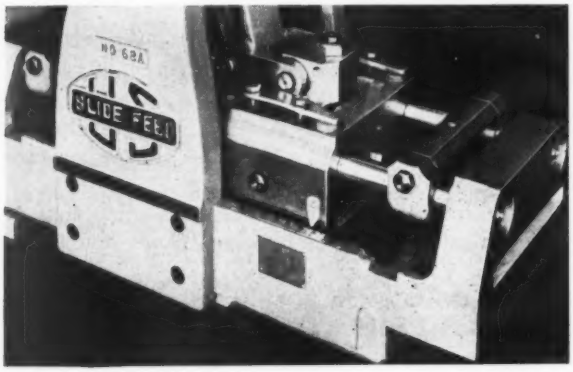
QUICK, VISUAL FEED LENGTH SETTING.

SIMPLE STOCK THICKNESS ADJUSTMENT.

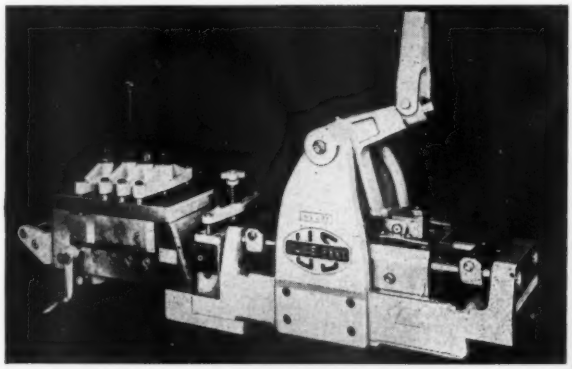
UNSURPASSED ACCURACY
(with or without pilots).

MORE POSITIVE CHECK.

Close-up of S. F.-68A U. S. Slide Feed showing indicator on feed block and scale on body, used for rapid feed length adjustment.



S. F.-68A U. S. Slide Feed with S. S.-27 U. S. Plain Stock Straightener. Conventional arrangement for feeding from left to right.



For complete information about the new U. S. Slide Feeds, write for Bulletin No. 101. Information concerning other U. S. Press Room equipment is yours by asking for Bulletin No. 85P.

PRODUCTS

U. S. TOOL COMPANY, INC.

AMPERE *(EAST ORANGE)* NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

CIRCLE INFORM-A-GRAM KEY NO. 34

Cadillac PLA-CHEK

Height gage and micrometer settings are 5 to 20 times faster with Cadillac PLA-CHEK than with other methods of comparable accuracy. Less than 15 seconds establishes *any* dimension within a 24″ range to limits of less than .0001″. No auxiliary gage blocks necessary—PLA-CHEK is totally self-contained. Dimensions are taken from the surface plate or from a base line on the work. Send coupon TODAY for complete details!

Cadillac PLA-CHEK Gages are available in a complete range of sizes from the easily portable 6″ and 12″ models for smaller jobs, to the 18″, 24″, 36″ and 48″ models for larger inspections. Precision-made risers in 6″ and 12″ sizes, such as the 12″ model for the 24″ PLA-CHEK shown above, may be used with all PLA-CHEK Gages.

Cadillac
GAGE COMPANY
P. O. BOX 3806 • DETROIT 5, MICHIGAN

MAIL THIS COUPON FOR COMPLETE DATA

CADILLAC GAGE COMPANY
P. O. BOX 3806, DETROIT 5, MICHIGAN
Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

Name_____

Company_____

Address_____

City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 35

Erickson Precision Expanding Mandrels Solve Machining Problems

Photo: Courtesy Ex-Cell-O Corporation, Detroit, Mich.

e. g. stainless steel aircraft sleeves

Tolerances of the highest order are required on aircraft sleeves. And when the material is stainless steel this can lead to production problems.

But Ex-Cell-O Corporation short-circuits their problems by using an Erickson 4½" C Drawbar Expanding Mandrel on an Ex-Cell-O precision boring machine. By using the Erickson mandrel they are able to machine completely the outside diameters, face a shoulder and put chamfers on both the OD and the ID of the exposed end. Production is up, rejects and scrap are down.

If you have a production part requiring exceptional tolerances . . . if instantaneous release feature can speed loading or unloading—Erickson Precision Expanding Mandrels can pay real production dividends.

AA-6723

Collet Chucks
Floating Holders
Tap Chucks
Indexers

ERICKSON Holding Tools
.0005
Guaranteed Accuracy

ERICKSON TOOL COMPANY

34451-1 Solon Road • Solon, Ohio

Tap Holders
Air-Operated Chucks
Expanding Mandrels
Special Holding Fixtures

Plagued by tough holding problems? Then let us show you how Erickson Precision Expanding Mandrels speed production and slash costs of machining, grinding, assembling or inspection. Write for your free copy of Catalog K today.

CIRCLE INFORM-A-GRAM KEY NO. 36

Guest Editorial

SEEMS AS THOUGH WE, who are up to our ears in metalworking sometimes miss the scenery because of the billboards. Sure, we're supposed to know all the answers to automation, gross national product, foreign competition, facts of machine tool life, and the rest of the economy-in-depth factors we all pontificate on at the push of a button.

What, however, does the man in the street think about these things, jobwise? Particularly, when he's laid off. Here's one answer, reported by Columnist Sidney Andorn, of The Cleveland News. He met a man who, as they say on TV, "thinks for himself." Reported below is what he thinks, and we thank Mr. Andorn for the research.

E. Willard Pennington
Editor

★ ★ ★ ★ ★ ★ ★

"LAST ONE who'll come off the lay-off is the goof-off, said the man at the work-clothes counter in the department store.

I been doin' me some thinkin', he went on, and I think I got it figured why business is getting better at the same time unemployment is not getting better.

Plants and shops are turning out more goods but they ain't usin' as many workers as they used to. So why? Don't say automation, although it's part of the reason why less men are needed anymore.

Automation can't goof off. Push the button and the machines do the work they're supposed to do. They don't sneak off to the men's room for a smoke, they don't hang around the toolroom swapping stories.

Well, the guy who's going to be called back to work is the guy who's like those machines—who'll put out work.

Forced to Lop Off Excess

THERE WASN'T many plants went out of business during this recession, said the man as he measured against his waist a pair of denim pants. He continued, know why?

Because the plants cut down on loss by pulling in their belts. They did this by shucking off the dead wood, cutting out jobs that kind of grew and that they carried along because they were makin' so much money it hadn't mattered before things got tough.

Also they cut off the goof-offs, the guys who weren't givin' a buck's worth of work for a buck's worth of pay.

This way they saved enough so they could weather the storm.

Can Produce More for Less

SO THE STORM'S slackened off now and the plants all of a sudden find out they can turn out as much work without the extra fat they'd been carryin' around and they can breathe easier bein' lean and trim.

So comes the time they get more orders they'll be puttin' on more men but not the kind of guys who are satisfied to do no more work than they have to, not the kind of guys who lay back and wait for the automatic pay-raises.

Can't exactly blame that kind of guys though because the whole system seemed to be aimed at mollycoddling the goof-off. The system of the plants and of the government.

Want No More Gold-Brickers

FAKER GOT the same prizes as the hard worker, got unemployment pay, pensions, accident pay, cost-of-living raises, social security, one like the other so why should a guy knock himself out?

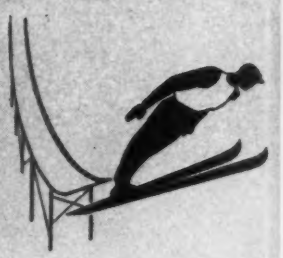
Well, the slowup is going to find himself out now, out of work for a long time until he sees the light and lets it be known he's going to give the job all he's got.

I see the light, said the man, and that's why I'm here buyin' these new work duds.

I'm expectin' to be called back to the job soon and I want to look just as sharp as I'm going to be."

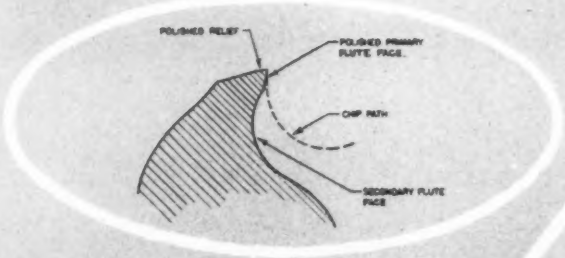
★ ★ ★ ★ ★ ★ ★

NEW! WELDON Ski-Kut END MILLS



FOR CUTTING ALUMINUM

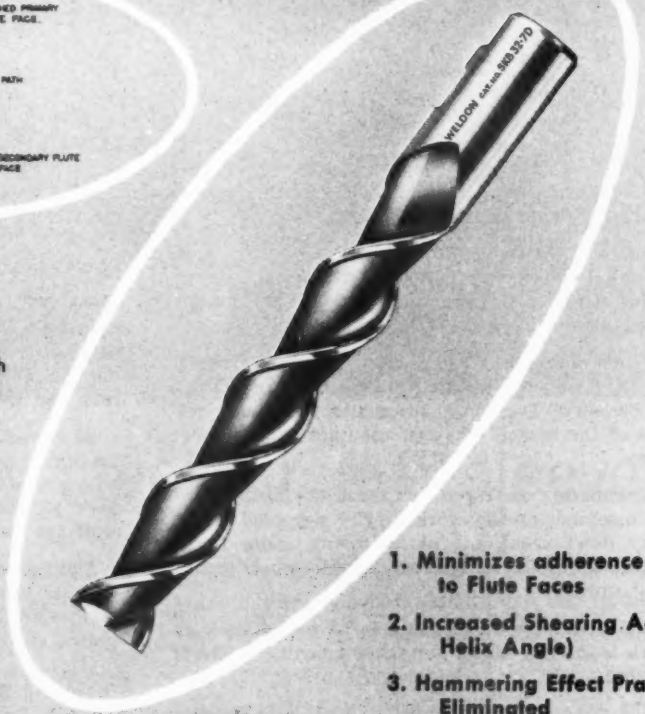
PATENT APPLIED FOR



CUTTING ALUMINUM MADE EASIER, SMOOTHER AND FASTER

The primary flute face of the Ski-Kut End Mills, being narrow, definitely minimizes adherence of chips to the flute faces. Such adherence or welding of aluminum chips contributes in a major degree to the difficulty in milling aluminum.

Greater feeds, longer tool life, better finish, easier operation of equipment are some of the advantages to be gained by the use of Weldon Ski-Kut End Mills for cutting aluminum.



Weldon SKI-KUT End Mills are available from stock in size from 1/4" to 2" in various lengths. For full information write for folder SKM-1

A RADICALLY NEW DEVELOPMENT IN END MILL DESIGN FOR CUTTING ALUMINUM THAT SPEEDS PRODUCTION AND REDUCES COST.

40 YEARS OF LEADERSHIP 1918—1958

1. Minimizes adherence of Chips to Flute Faces
2. Increased Shearing Action(45° Helix Angle)
3. Hammering Effect Practically Eliminated
4. Greater Feeds
5. Longer Tool Life
6. Better Finish
7. Easier Operation

Catalog list numbers are now marked on all Weldon tools and holders as an aid when reordering . . . another WELDON FIRST.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you. SK3

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

Two Successful Applications of

AUTOMATION FOR THE SMALL LOT SHOP

by James MacDonald
Manufacturing Engineer
Medium AC Motor Department
GENERAL ELECTRIC COMPANY
Schenectady, New York

AUTOMATION, LIKE MANY other words in our language, is being overworked. Originally, the word inferred material handling; later it was generally adapted to the large transfer machines used for manufacturing automobile components. Today's usage includes both factory and office operations.

We propose to use it to include single machine processes where the machine is tape controlled. Those who object may wish to do some original thinking and provide a new vocabulary for these diverse fragments of the new automation technologies.

Inasmuch as the small shops process 90% of the nation's business, concerted effort should be made to automate the small lot shops. A small lot may be defined as low as one's and two's, and here lies the problem—setting up for small runs. The solution may be found through the use of a few square inches of punched paper to store the machine functions, the tool functions, and the dimensional requirements, all in unalterable sequence.

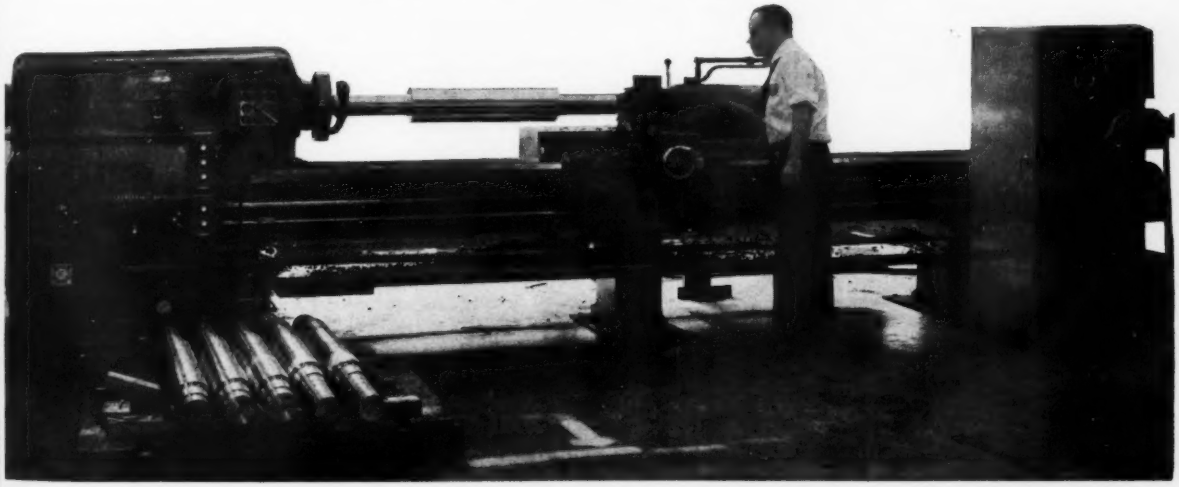
To eliminate setups with such operations, it may be necessary to redesign minor features of the product to group operations on a single machine, to re-group operations on other machines, or to re-tool and adapt to a single tool in place of multi-tool equipment. In some cases the machine and tooling must be designed to fit the type of control system and data storage system. Cammed or drummed equipment is an example of this.

To date the General Electric Medium A C Motor and Generator Department has made definite progress in adapting tape controlled equipment to standard machines and processes in making motor shafts and drilling end shields for motors. Our experience indicates that the saving from the utilization of data storage and re-usable tapes can be tremendous.

A lathe operator who made shafts for 35 years recently retired. We calculated that he cranked the cross carriage tool to 2¼" dia 170,000 times, and the tool to 3" dia 100,000 times. Repetitious operations such as these can be stored indefinitely, accurately, and inexpensively on tape.

In the turning and the drilling operations illustrated here, the operator's only chore is to load and unload the machine and change dull tools. Once the machine is loaded he is free to operate other machines.

Fig. 1. Numerically controlled lathe for turning shafts.



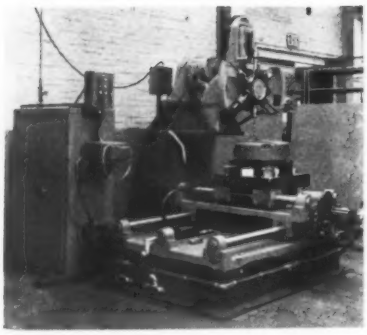


Fig. 2. Numerically controlled drilling machine for drilling and tapping motor end shields.

The lathe requires only one hour per day to load and unload and, if overlap is neglected, the operator can run many machines.

The tape-controlled lathe (Fig. 1) is used for making induction motor shafts of SAE 1044 carbon steel as large as 8" dia by 100" long. It is a standard American lathe, provided with special motorized lead screws. Because of this, there is no relationship maintained between the feed of the carriage and the speed of the headstock.

The headstock has an air-operated spring loaded center. A small bushing is attached to the face plate surrounding the center and the face of this bushing is used to locate the end of the shaft. This location is the common zero point required in the control system. The G.E. control system holds tolerances of 0.005" on the length and 0.003" on the diameter. The shafts are ground after turning so these dimensions are adequate.

In an attempt to eliminate as much setup as possible, a revolving tool post with four positions was designed and attached to the lathe. It indexes automatically from the tape and presents rough, finish, and radius tools to the work.

The numerical control system is a rectangular coordinate system and obviously has some limitations. By minor redesign, however, it was found adequate for our production needs.

The tape-controlled drill press (Fig. 2) was designed for drilling and tapping motor end shields made of cast iron. The machine was for a factory where only a limited number of shield sizes are built, so it was designed to handle all these sizes without any extra setup. A depth control has been added to the machine which permits a varying depth location on each drill.

A General Electric control system (with a selsyn system which is positioned from precision gear racks) is used. With it, a tolerance of 0.005" in any direction has been achieved.

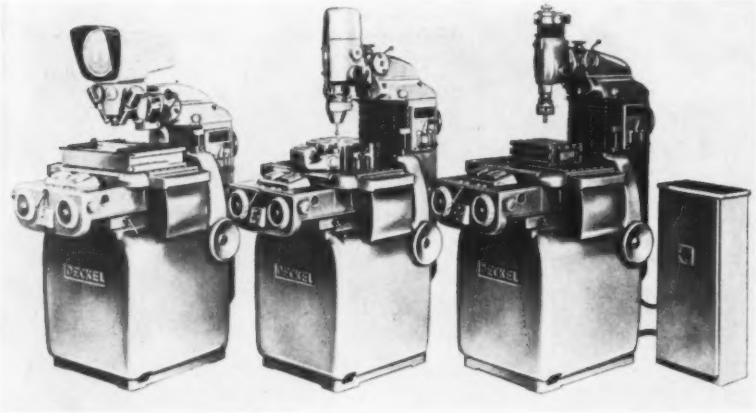
The holding fixture has concentric expanding jaws which handle diameters of 364 through 440 frame size shields, held rigidly in place by movement of the single lever. Ball bearing bushings and a ball bearing lead screw nut are used to reduce friction and make it possible to use very small drive motors.

Cycle time on this machine is approximately 4 min, during which time the operator runs a second machine which for the present is manually-operated. When the shield has been processed on these two machines, they're ready for assembly. end

THREE HEADS SWITCHED ON ONE BASE TO BORE, GRIND, INSPECT

CHANGE FROM JIG BORING to jig grinding or optical projection measuring takes only minutes with a new Deckel machine featuring interchangeable heads mounted on a single base. Each of the three heads can be used as a single-purpose machine, or all three as a universal machine with only one base.

This versatile new machine, introduced by Cosa Corporation, provides for direct reading of table measurements in numbers to 0.0001" by projection of precision glass scale graduations through a system of lenses and mirrors. There are no conversions or interpolations to cause reading errors. The stationary transverse scale is mounted on the machine base, and the movable longitudinal scale on the worktable slide. Two projection screens, one for each scale, are mounted on the cross-slide. On each scale the desired readings can be set to 0.0001" The worktable is then adjusted until the projected index line of the desired setting is centralized in the proper light gap on the screen. For measuring, the procedure is reversed. Under test, operators have been able to obtain a reading accuracy of ±0.00002". Actual positioning accuracy falls within 0.00012".



To further protect the accuracy of these machines, the supporting bracket contains built-in compensation for thermal expansion. Additional thermal stability is provided by a special air duct that dissipates heat generated from the drive motor and by an extra large amount of oil to maintain practically constant gearbox temperature.

The boring spindle of the jig boring machine has 20 different speeds from 40 to 3150 rpm and six different feed rates either up or down.

On the jig grinding machine, the grinding spindle has 12 planetary motion speeds from 40 to 500 rpm and infinitely variable grinding speeds from 15,000 to 60,000 rpm. All types of grinding can be performed.

The measuring machine will perform all types of measuring operations. It projects images on a 7⅞" screen to a magnification of 10 or 20X.

GAGE CONTROL MEANS A QUALITY PRODUCT

by John Starbuck
Gage Engineer
AEROQUIP CORPORATION
Jackson, Michigan

WHEN AEROQUIP CORPORATION COMMON STOCK became listed on the New York Stock Exchange in August, 1955, the symbol chosen to denote the company's name on the ticker tape was "AQP." As gage engineer at the company's Jackson, Michigan, Plant, I look at that symbol two ways. It's an obvious abbreviation of the company name, but it can also mean A Quality Product. And the manufacture of quality product starts with good gage control.

Producing a quality product at our plant means meeting the high standards of the aircraft industry, both military and commercial. We produce flexible hose assemblies, detachable, reusable fittings, self-sealing couplings, tubing products, and a variety of related components for aircraft, missiles, and ground equipment.

Fig. 1. A systematized gage crib is the heart of a gage control system. The gages here, plus those on duty in the gage laboratory and those allocated to jobs out in the production departments total up to 27,000 gaging units.

Fig. 2. Record keeping in the gage crib pays off in terms of a gage's in-and-out record, its whereabouts, its state of wear (and when last checked) and its supplier and cost. Aeroquip's good housekeeping starts with the care shown in handling and storing the gage equipment.

Other divisions of our company produce similar products for other industries. But the aircraft industry was our original market, and it was in meeting these high standards that we set the quality control pace for our entire organization. We believe at Aeroquip that effective quality control starts with gage control.

At Aeroquip, our gage requirements originate with the gage engineer. The gages are designed in our engineering department. Upon completion, the designs are approved by the gage engineer and orders are then placed with our gage makers. When the gages are received from the makers, they are brought into the gage laboratory where they are checked for dimensional accuracy.

Obviously, if gages are used, they are subject to wear; therefore, they are continuously passing through the gage laboratory for periodic checks. These checks are made as frequently as experience has taught us is necessary, through the use of our gage usage records. To illustrate, there are gages that are checked weekly, semi-monthly, monthly, and some even annually. All checking periods are set to keep all gages well within their tolerance limits.

All tooling, jigs, and fixtures must clear the gage laboratory as being dimensionally correct before going into service. We at Aeroquip believe that the requisites of good quality control in production of acceptable parts are, first, accurate tooling, and second, accurate gaging. Therefore, it is imperative that we know that our tooling and gaging is always within specified tolerances.

The types of gages most frequently checked are thread plug gages. These are in three categories; namely, *working*, *inspection*, and *final inspection* gages. Then there are thread setting plug gages used for setting and adjusting thread ring gages. All of these gages are checked to extremely close tolerances.

When originally checked upon receipt from vendor, they are checked for lead, drunken lead, flank angles, major diameter, minor diameter, and pitch diameter. If they are accepted and used, then they are checked periodically for pitch diameter only. All of these checks are made under specifications as set forth in Screw Thread Hand Book H-28 as issued by the U. S. Dept. of Commerce, National Bureau of Standards.

Other gages receiving periodic checks are gage blocks used in setting adjustable limit gages such as standard snap and indicator snap gages and bench type comparators, master setting gages, ring gages and cylindrical plus gages, micrometers, depth micrometers, and vernier calipers. We have in our inventory 27,000 units of gaging equipment.

Many of these gages are in continuous use. When gages and tooling are checked, a gage laboratory report is completed showing the actual measurements. If the gages or tools are accepted as within tolerance, they are then moved from the laboratory with the reports; tooling is moved to the tool crib and gages to the gage crib. The gage laboratory reports are in triplicate. One copy remains with the gage or tool, one copy goes to the quality office

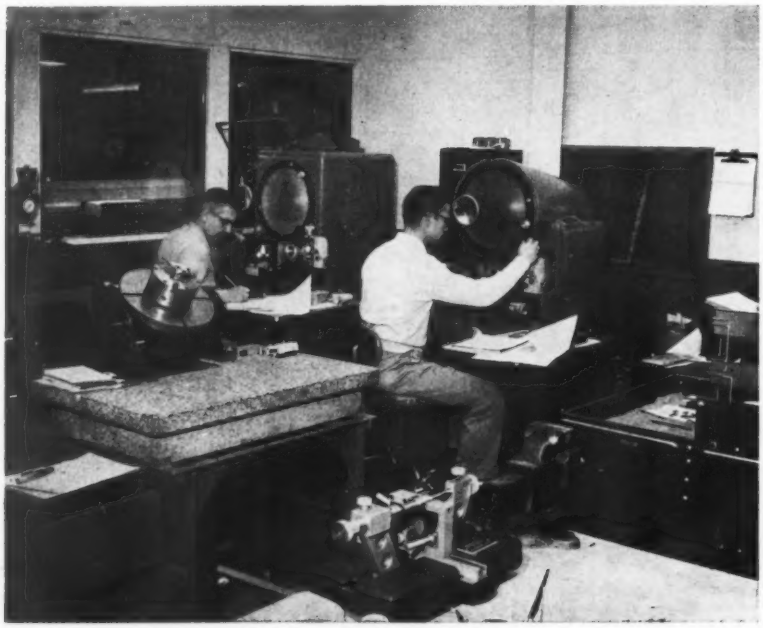


Fig. 3. Aeroquip's gage laboratory provides the precision equipment and ideal environment essential to rigid dimensional control of tools and gages. The room is held to a constant temperature of 68°F, ±½°, with a humidity of 50% or less. Filtered, dust-free air helps prevent "fuzzy" shadow profiles on the screens of the Kodak contour projectors.

Fig. 4. In the background is an original Bausch & Lomb Balcrometer. This has been succeeded by B&L's new DR-25 (on bench in foreground) which has a measuring range (spindle travel) of 0-3" without gage block buildups, in calibrated increments of 0.0001", and easily read to 0.000025" (quarter "tenths").

and one copy is attached to a copy of the purchase order which is filed in the inspection office.

The gage laboratory report lists the vendor's name, the purchase order number, the tool or gage number, quantity received, date of inspection, the name of the technician making the inspection and the number of gages or tools accepted or rejected. From this information a report is completed every month by our quality control department listing all vendors, showing the number of tools or gages accepted or rejected as received from each vendor.

If tools or gages are rejected a discrepant material report is completed showing the reasons for rejection. Copies of this report are forwarded to the inspection department, production control department, purchasing department, and one copy is forwarded with the tool or gage to the shipping department for return to the vendor. We are able, as a result of the monthly report of vendors, to know who the vendors are who take pride in their work and they are the ones we patronize.

From the laboratory inspection report remaining with tools or gages, records are kept in our tool and gage cribs. In the gage crib we maintain a gage record file in which every gage we own is listed. This record consists of an inventory showing the total number of each size or type of gage, the name of its maker, its purchase price and the purchase order number.

Under each gage inventory card is attached a check record sheet for each individual gage. This sheet shows the date it was checked, by whom it was checked and its actual size on the date it was last checked. This information is taken from our gage laboratory inspection report. On the gage record sheet we also have space for an in and out record, showing the date the gage was issued, the department to whom it was issued and the date it was returned.

Thereby, we know at all times where each individual gage is being used, its actual measurement at the time of issue and the date returned. When any individual gage is returned to the gage lab this information helps us to determine how the gage was used or misused; excessive wear means the forcing of parts being checked on to the gage, mutilation indicates misuse in handling and poor housekeeping.

We at Aeroquip believe that if we do not show respect for our gaging equipment we cannot expect our employees to do so. Good housekeeping starts with the care we show in storing and handling our gage equipment. Our gage laboratory is kept at a constant temperature of 68°F, ±½°, humidity at or below 50%. The 68° target is the accepted International Standard of temperature for the precise measurement of all precision gaging equipment. Humidity of 50% or less is maintained to help eliminate oxidation, rusting and corrosion.

Our equipment is, we believe, the best or equal to the best obtainable. We use two Kodak contour projectors and measuring machines, two Rockwell hardness testers, three 85-piece sets of Johansson gage blocks, one 85-piece set Fonda Carbide gage blocks, a Profilometer, three Mikrokator bench comparators (reading in increments of one tenth of a thousandth, fifty millionths of an inch, and five millionths of an inch), one Bausch & Lomb Balcrometer and one Bausch & Lomb DR-25. These are both linear measuring machines having a range of zero to 3", with a

Fig. 5. A close-up of Aeroquip's frequent use of the DR-25: thread plug gage measurement by the three wire method. The generous spindle travel means that a great range of gage size, can be accommodated as is, without accessories.

Fig. 6. "Drunkenness" of thread lead or helix is quickly measured on this checker developed by the author and manufactured by Pipe Machinery Company. The indicator shows the deviation from true pitch in any one rotation of the thread plug.

direct reading well within one tenth of one thousandth of an inch, without the use of gage blocks.

In 1953, we purchased our Balcrometer. Our experience showed us very quickly the saving in time we were able to accomplish through its use. Our laboratory personnel is naturally limited by our size and equipment. Therefore, man hours are very precious to us not only because they cost us money, but because of time we just don't have. When we learned we were able to save 85% of our time in checking cylindrical plug gages, of which we check hundreds each week, we were sold on the Balcrometer. We could eliminate all of the time consumed in gage block build-ups necessary in order to check each go and no go cylindrical plug. Our checks were also more consistently accurate because we were not faced with the necessity of using great care in ringing gage blocks together properly and letting them cool back to room temperature so that errors would not develop.

In the early part of 1958 Bausch & Lomb introduced their new DR-25 linear measuring machine. They loaned one of these gages to us for a period of two weeks and asked us for our approval. We immediately put it into use in our laboratory and were very enthused with its repeatability, its stability, and extreme accuracy. We learned through the benefit of its use that we were able to make, not only all of the measurement previously made on our Balcrometer, but we also could check our thread plug and thread setting plug gages, using the three wire method, and saving two thirds of the time we previously consumed checking these gages when using gage blocks and bench type comparators. We are also able to check these gages with more consistent accuracy with the DR-25 because of the reasons above. Such equipment rapidly pays for itself in accuracy and man hours saved.

We also use a multitude of other precision equipment consistent with the demands of our operations, such as height gages, cylindrical squares, fixed steel squares, protractors, indicating micrometers, torque wrench calibrating scales, microscopes, surface plates, thread lead and drunken lead checking equipment.

The instrument for checking and measuring drunken thread lead is an Aeroquip development.* It is now manufactured, under license by the Pipe Machinery Company.

The end result of our Quality Control procedures has been to build the confidence of our employees in the accuracy of the tooling and gaging equipment they use in manufacturing our products and to insure acceptance by our quality control department. Without our gage laboratory, we would find it impossible to retain our high standard of quality hoselines, fittings, and self-sealing couplings for aircraft. The gage laboratory is recognized as the basis and heart of precision and quality by employees and management at Aeroquip. end

Fig. 7. Throughout the plant at the machines, the gages are protected by cloths on the benches—a matter of respect for precision tools.

** Dear John Starbuck: Your extreme modesty motivated you to scratch the words we added to your story crediting you with the original design of the drunken lead checker. You did guinea-pig the first lead checker, and we insist on giving credit where credit is due. So let this be a lesson to you: don't trifle with the freedom of the press!*

Regards,
Bill Pennington
Editor

NON-VIBRATING FOUNDATION ASSURES MACHINE ALIGNMENT

HERE'S HOW...

AN AGGRESSIVE EQUIPMENT REPLACEMENT POLICY, to provide facilities for maximum economy and effective production, is followed by the Struthers Wells Corporation of Titusville and Warren, Pa., a century old manufacturer of steel and alloy forgings, boilers, and welded products.

This is especially true with respect to large multi-throw Diesel, compressor, and gas engine crankshafts, that frequently weigh in excess of 8½ tons, and are the major products of Struthers Wells.

The greatly increased operating speeds and tremendous pressures of modern turbo-charged reciprocating engines, representing the most recent state-of-the-art, dictate optimum dimensional tolerances, surface quality, and geometry of the pins and journals of their crankshafts. The justified ultra precision of crankshaft manufacture is in the micro-inch class where the decimal point often advances more rapidly than does the tooling required to economically produce it.

The pins and journals of these crankshafts, Figure 1, must have absolutely equal diameters and have highly refined surface quality not to exceed 8-microinches rms, which is accomplished only under the most strict conditions.

The solution to these needs and desired characteristics was the selection of a Landis 40″ x 216″ crankpin grinder, which readily produces a surface finish of 4 or 5 microinches at dimensional tolerances within 0.0001″ to 0.0005″; and roundness and parallelism within 0.0001″ to 0.0002″. This pin grinding process also corrects any geometrical surface inaccuracies such as any taper or out of roundness, which may remain after turning in a lathe, to within 0.025″ stock allowance for grinding.

Basically the grinder is a roll grinder equipped with special work heads, drive, and tooling designed specifically for grinding the pins of large crankshafts. It will swing 43¼″ over the ways and accommodate cranks up to 19′ 2″ long.

Grinder Foundation

It was extremely essential that perfect alignment of this machine be maintained under all conditions in order to reliably produce crankshafts on which the pins and journals will be round within 0.0005″, straight within 0.0002″, the radius of throws held within 0.005″, and diameters within 0.001″.

Although the grinder weighs in excess of 125,000 lbs with its extra heavy bed, every precaution was taken to isolate the machine from external sources of vibrations for stability and to prevent misalignment or distortion of the frame. To accomplish this, a duo-foundation was constructed that in effect floated the grinder foundation block on a cushion of sand. Preparation for this construction required the excavation, Figure 2, of over 150 cu yds of earth to a depth of 7′ 6″ and the removal of several old foundations for machinery that had previously occupied the site.

The machine was set on a foundation requiring 78 cu yds of solid concrete, Figure 3. This main body of the foundation in turn was poured inside a concrete "water seal" or box, Figure 4, and is insulated from this box by 12″ of dry sand underneath and around the perimeter of the block.

To insure that the sand would always remain dry, the concrete water

by R. A. Butler
Plant Engineer
STRUTHERS WELLS CORPORATION
Titusville, Pa.

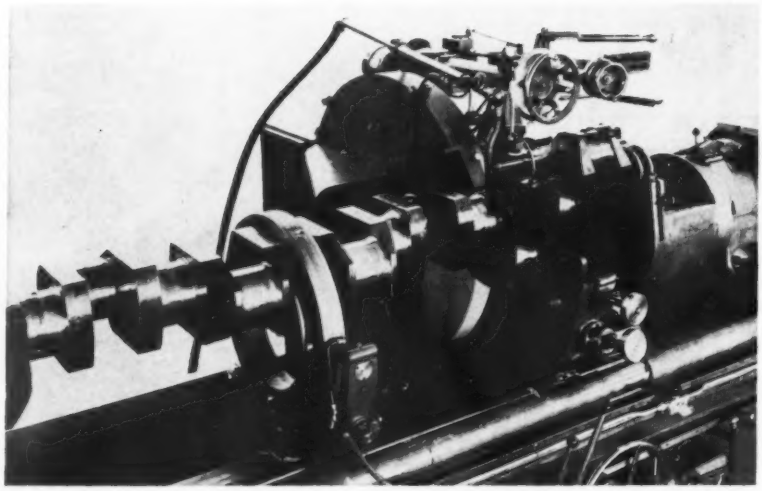


Fig. 1. A large crankshaft is shown set up in a Landis 40" x 216" hydraulic grinding machine ready for grinding the crankshaft pins and journals. A 54" dia x 4" face grinding wheel is shown in working position.

seal was set on layers of gravel and Sisalkraft paper spread over firm earth 7' 6" below floor level. The concrete box itself was poured, using a 1:1½:2 mix, (1 part cement, 1½ parts of sand, and 2 parts of stone or gravel) with 6-gal of water per 94 lbs of cement for its workability and water tightness characteristics. 55 cu yds of concrete were used in this water seal, which was poured without interruption except for spading and ramming to prevent stoppage planes.

As a further safeguard against water entering the seal underground, the box was water-proofed on the outside by Sisalkraft and on the inside with a lining of Visqueen plastic film.

The sand used to insulate the grinder was purchased dry but before placing in the water seal it was further dried by heating in one of our large car type heat treating furnaces. The otherwise exposed 12" border of sand between the perimeter of the foundation block and water seal at floor level was covered with 3" of asphalt to prevent any surface water from wetting the sand.

Summary

In the past, when a crankshaft approached the completion stage, the finishing operation adhered very closely to the procedure outlined below — each step of which required "kid-glove" handling:

1. Finish turn the pins with 0.025" stock allowed for webbering.

Fig. 2. Preparation for this dual foundation required the removal of 150 cu yds of earth from an excavation 7' 6" deep below floor level.

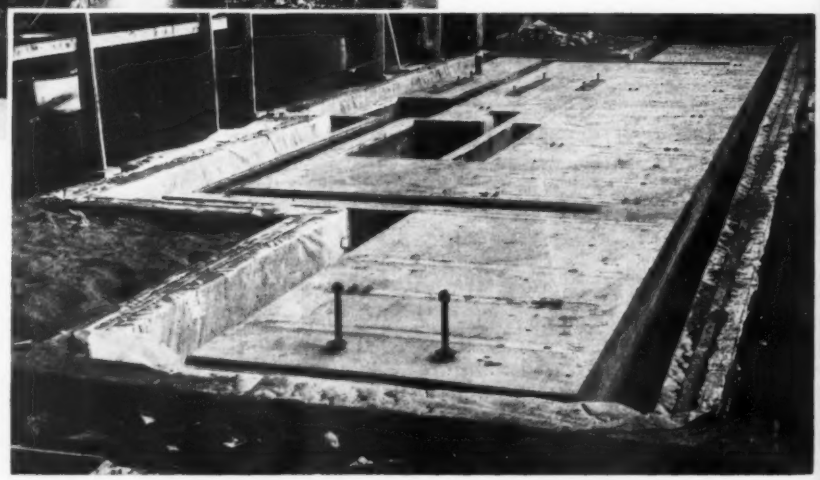


Fig. 3. Grinder foundation is shown set inside the "water seal" or box before placing 12" of sand around the perimeter of the main foundation block. The foundation block rests on 12" of dry sand.

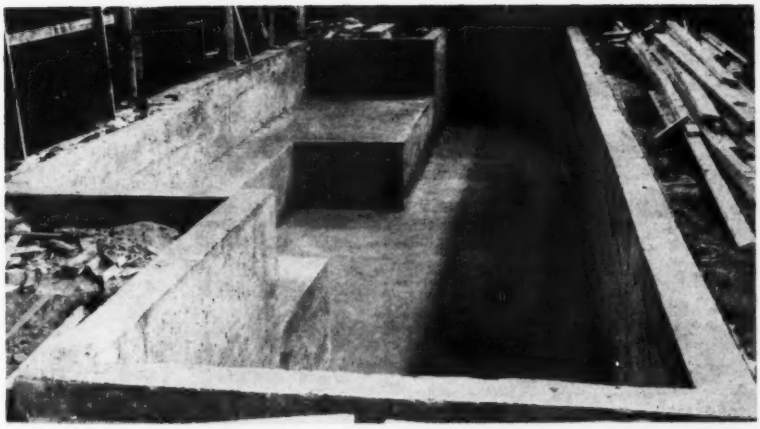


Fig. 4. This view shows the "water seal" or box ready for placing 12" of sand on the floor on which the main foundation block will rest as shown in Figure 3. It was poured on layers of gravel and Sisalkraft paper. Exposed places between the perimeter of the foundation block and the water seal at floor level were waterproofed with 3" of asphalt.

2. Webber to within 0.003/0.006" of the finished diameter.
3. Remove from lathe to check on surface plate for run-out and parallelism.
4. File by hand to remove any high spots, taper, or out of roundness and leave 0.002" stock for polishing.
5. Return to lathe for polishing.
6. Return to plate for hand polishing where there was a possibility of creating a surface which departed from a true cylinder.

The modern precision built engine lathes and crank grinders now permit:

1. Finish turning with 0.025" stock allowed for grinding.
2. Grind to 0.002" oversize for superfinishing and polishing.
3. Super finish and/or polish to size. External honing or superfinishing operation removes any high spots and spurious layer of metal averaging 0.0001" to 0.0002" on the diameter and creates a perfect curvature.

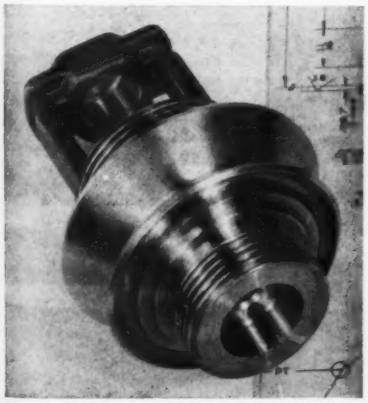
Specifications stipulate that the surface quality of the pins and journals must not exceed 8-microinches rms. The Landis grinder readily produces a surface finish of 4 to 5-microinches, but with the grinder mounted on the non-vibrating foundation, the greatest possible degree of geometrical and dimensional accuracy is economically achieved with a finish of 1 to 4 microinches rms on all crankshaft pins and journals.

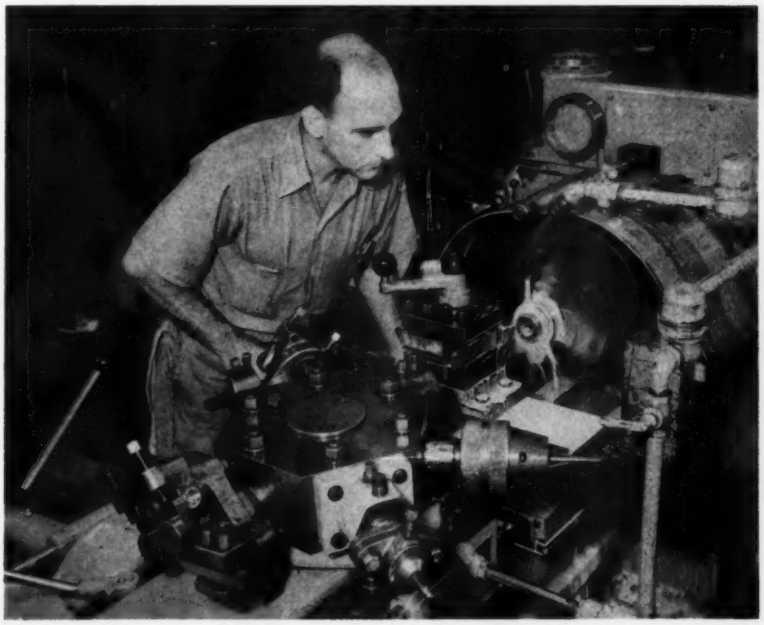
end

FANCY LATHE SETUP FOR NUCLEAR SUB PARTS

Complicated bonnets for 2" capped glove valves, used to control the flow of demineralized water in the reactor unit of atomic submarines, are machined to a 32 rms finish with an efficient turret lathe setup at Efco Manufacturing, Inc.

Each workpiece, a Monel forging incorporating a 60% cobalt valve seat, requires intricate forming cuts, along with 8-pitch Acme threading. Efco meets the stringent accuracy and finish requirements of these parts with carbide tooling on a Warner & Swasey #5 lathe. Each forging is machined complete in just 28 min.





CURRENT REPORT ON PLASTIC

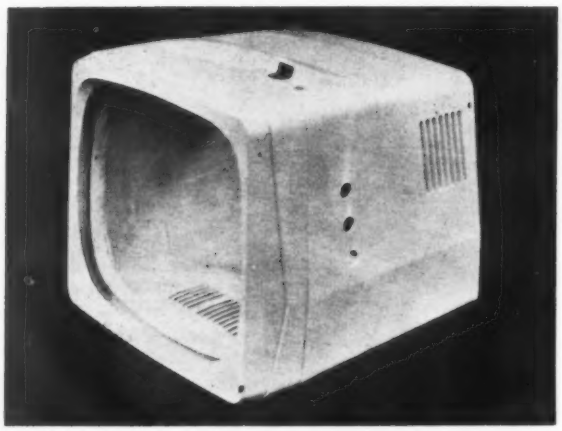


Fig. 1. A laminated TV cabinet model, made of plastic before production of metal units could begin.

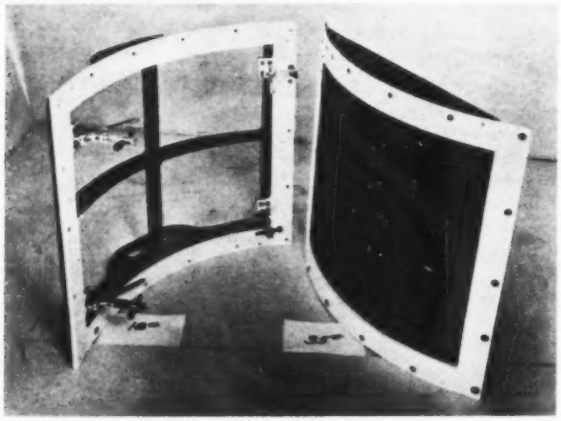


Fig. 2. Drill fixture master (weighing only 35 lbs, compared to the previously used 180 lb metal fixture) and a trim fixture of plastic.

PLASTIC TOOLING materials and techniques have been on the industrial scene for many years. But, success stories from users, news of formula improvements, and the increasing interest in any product or process that can cut costs have brought with them renewed enthusiasm for both trying out and increasing the use of plastics for many manufacturing jobs.

Illustrated on these pages are a variety of applications common to many plants. Used as an "idea starter" they can suggest numerous additional application possibilities in plants not now using plastics to their physical and economical limits. The illustrations are from Ren Plastics' bulging case history files.

A prime mover in the latest drive toward full use of plastics for tooling purposes, Ren Plastics, Inc., has taken it upon itself to show industry the possibilities available and to explain the relatively simple methods involved in fabricating plastic tools. Its series of 16 seminars across the country is drawing capacity crowds of tool engineers and designers who are trying to find how and where they can use plastics economically. Live demonstrations at the seminars give attendees an idea of how the syrupy, and even gummy, resins are mixed and applied.

Ren is quick to point to plastic tooling for time- and money-savings where plastics' properties can be used to advantage, and equally quick to recognize and warn of their limitations. On the plus-side are the facts that for many jobs plastics can cut tooling time and costs as much

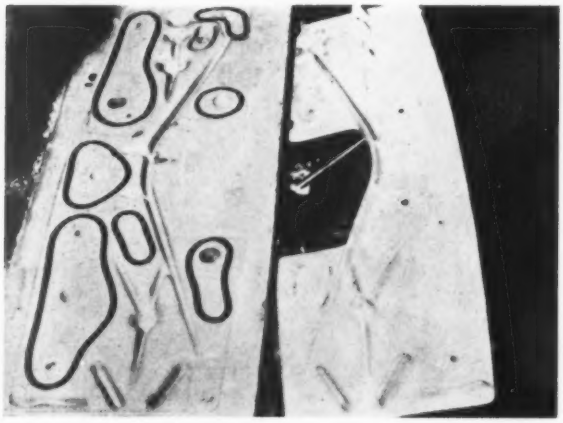


Fig. 3. A mass-cast vacuum holding fixture for a milling operation on thin aluminum forgings. Base is a metal weldment.

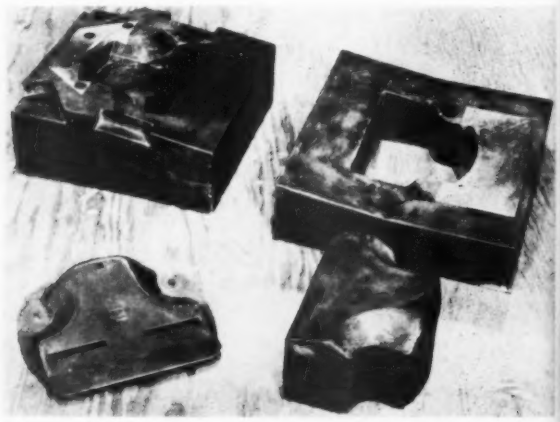


Fig. 4. Draw die, removed from die set, that drew 17,000 license plate brackets in 48 hrs, then was refaced to draw 12,000 more.

TOOLING'S PRODUCTION USES

as 50%. They are light in weight, easy to store, exceptionally good for intricately contoured surfaces, and easy to modify if minor design changes are necessary. For straight surfaces for long runs, Ren admits however, metals are usually best.

Uses? Quick production prototype parts; economical production of checking masters that are stable, light in weight, easy to handle, and easy to care for; checking fixtures that are quick to prepare and cheaper than metal ones; form dies; paint spray masks; gages; holding fixtures; keller models; draw dies; foundry patterns and core boxes; chucks; and so forth.

Methods of fabricating plastic tooling include laminating, surface castting, mass casting, splining, and many combinations of these. The first three use liquid resins; the latter, paste plastics. None require the degree of skills needed for building metal tools.

In laminated tools, layers of glass cloth and liquid plastic are molded to the desired shape, as in Figure 1. They are usually reinforced with a framework of metal or plastic, and are most stable.

Surface cast tools usually have a metallic core, as the forming die in Figure 4. Mass cast tools, such as in Figure 3, are usually all plastic, although metal inserts are sometimes added at stress points.

Paste plastics, such as used for splining (Fig. 8), are applied to the surface desired with a putty knife, and are used extensively for preparing master models.

end

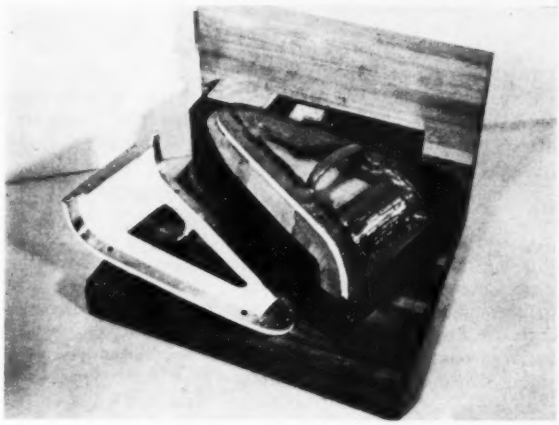
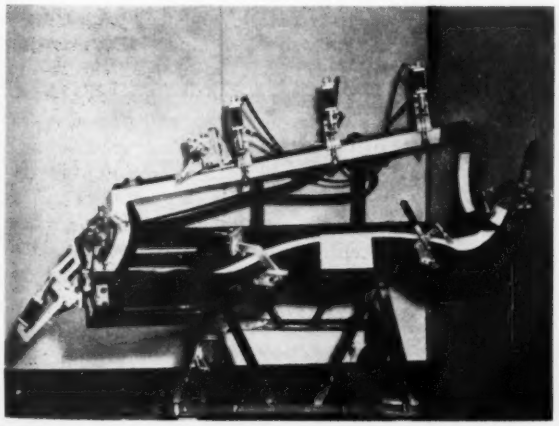


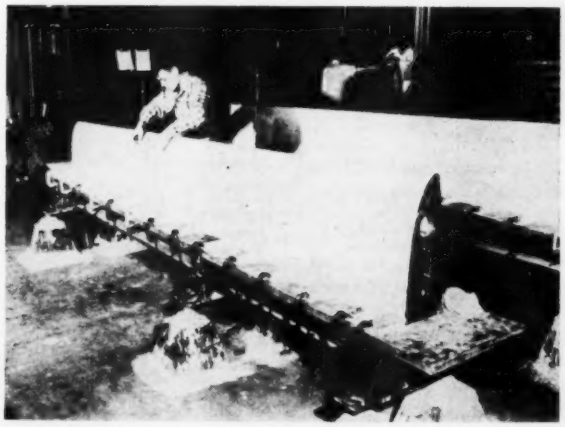
Fig. 5. Plastic checking fixtures for an automobile tail lamp opening.

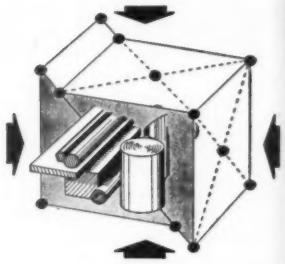
Fig. 6. Lightweight plastic reproduction of a complete floor pan for use as a trim buck in an engineering department.

Fig. 7. Stable, lightweight fender welding fixture of plastics.

Fig. 8. Master of the leading edge of a plane wing being fabricated with paste plastics by the splining method — working to mounted template.







VALVE HOUSINGS IN A HURRY

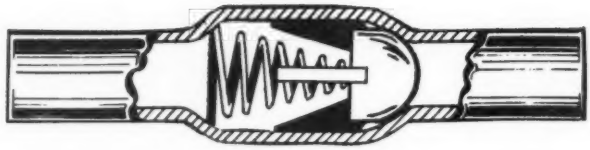


Fig. 1. Check, relief, and restriction valves of this construction, and those of greater complexity benefit production-wise from swaging.

THE VALVE, shown in figure 1, was formed in a Fenn swager. After one end was swaged, the valve components were inserted, and the second end was swaged to retain them. This provides a leak-proof housing which is ideally suited to sealed systems that circulate fluids or gases. The use of this method of assembling valves does not preclude the use of standard screw connectors for inserting them in circuit lines; secondary threading operations provide the necessary thread, or solder connections can be easily arranged.

It is easy to see how this type of construction aids in keeping both the size and weight of any product to an absolute minimum.

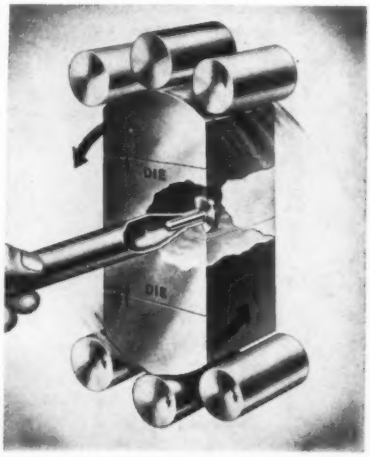
This particular valve started out as a straight piece of tubing having an appropriate wall thickness in keeping with the wall thickness of the circuit tubing. In cases where the whole workpiece undergoes cold forming, by swaging methods, the wall thickness can be reduced considerably, and still maintain the minimum bursting pressure, since *cold working increases the strength of most metals.*

In passing, it should be noted that reductions of this type are most successfully accomplished on swaging machines. However, if the reduction is slight, it is conceivable to do it in one hit in a single set of reducing dies in a punch press.

The first question that a reader might ask is: "How is swaging done in assembly jobs where the assembled items (the internal parts) would be thrust into the swaging area and appear to be damaged?" We are told by the people at Bodnar and McDermott Mfg. Co., Inc., supplier of these valves, that in these instances a center pin is used to retain the internal components in their correct position. A work stop stops the swaged shell so that it will not be swaged past a desirable point. In this case, the center pin keeps the spring plunger depressed and away from the area being swaged, while the tubing advances into its stop in the die. It is even possible, through these stops, to arrive at an accurate spring pressure which must be maintained in order to control the cracking pressure of the valve.

Fig. 2. How the valve ends are formed. Shown here are the swaging dies in action. Metal is formed by a succession of rapid hammer-blows.

Photo, courtesy of Fenn. Mfg. Co.



In instances where the valve ends are to contain a female thread, the tap drill size can be achieved by swaging around a mandrel, in the thread area. Here the mandrel would have the same diameter as the tap drill — thus eliminating the necessity for tap drilling. The valves we saw, which used this swaging principle as a matter of forming, appeared to carry a cut thread, a secondary operation, when a male threaded end was necessary.

The writer sees no reason why the secondary threading operation could not be done by thread rolling to further realize the advantages of cold forming. It would appear to be a simple matter to maintain the pitch diameter of the desired thread by the use of the proper diameter swaging die.

We were told that in some types of valves, an end-stop was found impractical, since the internal assembly of the valve was a rigid sub-assembly, and had to be held tightly between the deformed ends of the tubing. Here too, some tubing is not predictable as to elongation, and the use of an end-stop resulted in too tight or too loose an assembly. They found, after some experimentation, that the problem was not a big one, and that a skilled mechanic could "feel" when the swaging die encountered the internal sub-assembly thus enabling him to stop after sufficient swaging and before damage.

—William E. Hoffman

INTEGRAL CONSTRUCTION

. . . what it can mean to you and how it's done

TOOLING & PRODUCTION Magazine
Air Power FOR METALWORKING

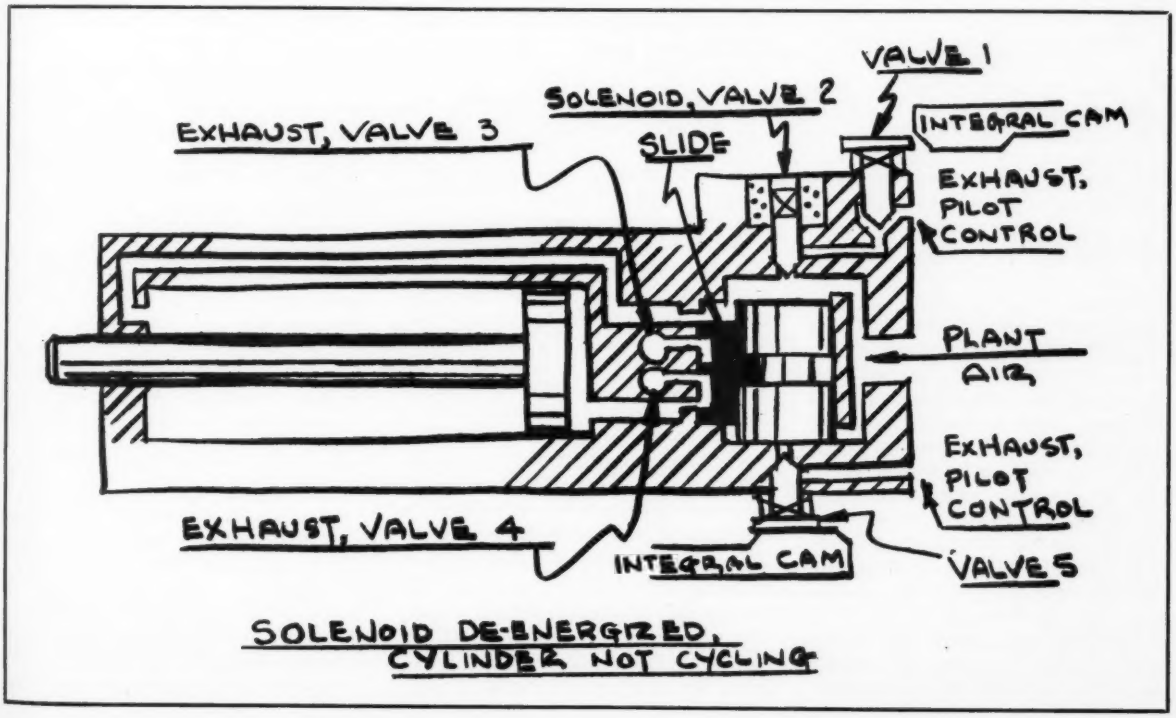
First off, it can mean a savings in equipment cost, installation cost, and maintenance expense — the same old things, but who's not interested. More than this, there are often setups possible with an integrated mechanism that are impractical and at times otherwise nearly impossible. The case in point concerns an air cylinder with built-in valves, thus providing integral control and other advantages because . . .

by William E. Hoffman
Associate Editor

WITH THIS CONSTRUCTION-APPROACH you can save additional costs involved in purchasing a number of individual components. Everyone knows, even without Purchasing experience, that buying several items is more expensive than buying one. *Initial savings* would also include the price of pipe, tubing, and the fittings necessary to integrate a scheme into a working tool with a basketful of parts.

Of course, even before the purchase of the items, it is necessary for Engineering to lay out a diagram. The more complex, the more time spent there — and the greater the chance of error. After Engineer-

Fig. 1. A stylized sketch showing an air cylinder with built-in valves. Cam indications are a part of the integrated mechanism. It requires only plant air and a simple provision for energizing the solenoid.



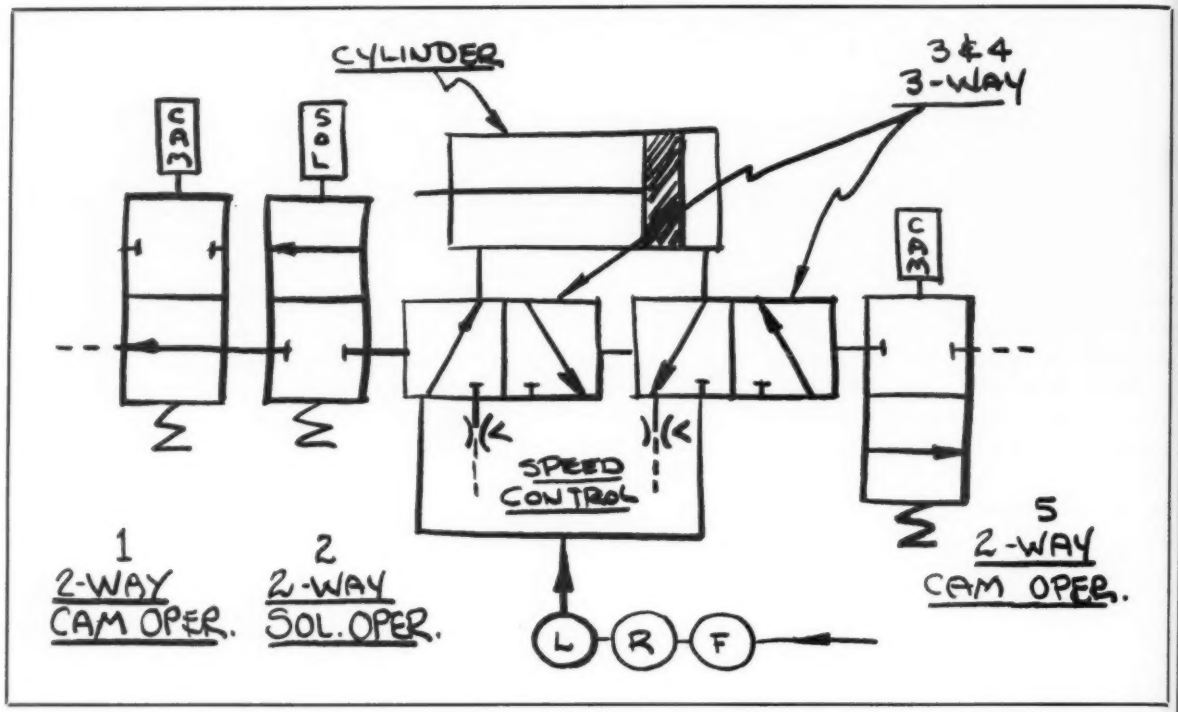


Fig. 2. JIC diagram of valves shown integrated in Figure 1. If valves were not built-in, along with other control features, five individual valves would have to be arranged with piping to do the same job.

ing "specifies," checking is necessary. Etc. Each individual through Purchasing ends up putting much more time into procuring a number of items, than if just one were required.

What can be said about *installation*, except: "It's for sure easier on the budget to install one item than more than one." In the example there would be five basic valves to integrate plus the accessory speed control valves. Compare Figure 1 and Figure 2. Figure 1 shows integral construction incorporating in one unit all the valves diagrammed in Figure 2.

It's true, if the air motor (air cylinder) with built-in valves were a "special" it would undoubtedly be more expensive than a system built up of standard components. But in this case, and in countless other cases, there are standard products available which integrate components to a better end result than would be possible any other way.

To make this integration feasible there must be sufficient market-demand to end up with an attractive price tag. For the integration of a cylinder and its control valves, demand is no problem — a reciprocating power source is needed in almost all plants in some way or another.

Maintenance-wise, the fewer the fittings, the less chance for leaks. If a system does leak it creates a loss of power at the tool as well as at the compressor, meaning less production and higher compressor operating expense.

Space-wise an integrated mechanism is desirable since space is generally at a premium. However, using separate individual components, "tied" together by pipe or tubing, there is great latitude in their placement one to the other. This is especially so in hydraulics where for all practical purposes the oil is incompressible and the system is often closed and full throughout. To some degree this is also true in pneumatics, except in instances where exceptional speed of operation or fast return (quick dump) are needed. Although quick dump valves are available for use close to the work unit, they are not always a necessity in a closely integrated system.

A designer's first consideration is workability and in looking for his design-answer he considers simplicity his first "guide-post." What could be more simple, when a reciprocating action is needed, than to apply an air cylinder with built-in valves? Having this, his only concern is an electrical impulse to start the action.

Before we discuss this "packaged" circuitry it should be mentioned that although Figure 1, for clarity, shows one-piece construction, it is not. Integrated doesn't mean one-piece construction. Actually the example (Fig. 1) is made from a number of parts for easy fabrication, assembly, and maintenance.

It's true that all "fluid power" circuitry doesn't lend itself to integration as readily as the subject example, and that there are a tremendous number of circuitry answers possible for any pneumatic problem. Consequently, you won't always find an integrated "answer" to your problem, but among your investigations we recommend a look at manifold and panel block construction.

Manifold and panel block construction is becoming popular as a number of companies offer more and more possibilities with their increased number of standard compatible modular components. If you are not acquainted it means: fluid power circuitry created for the most part without piping. The valves are

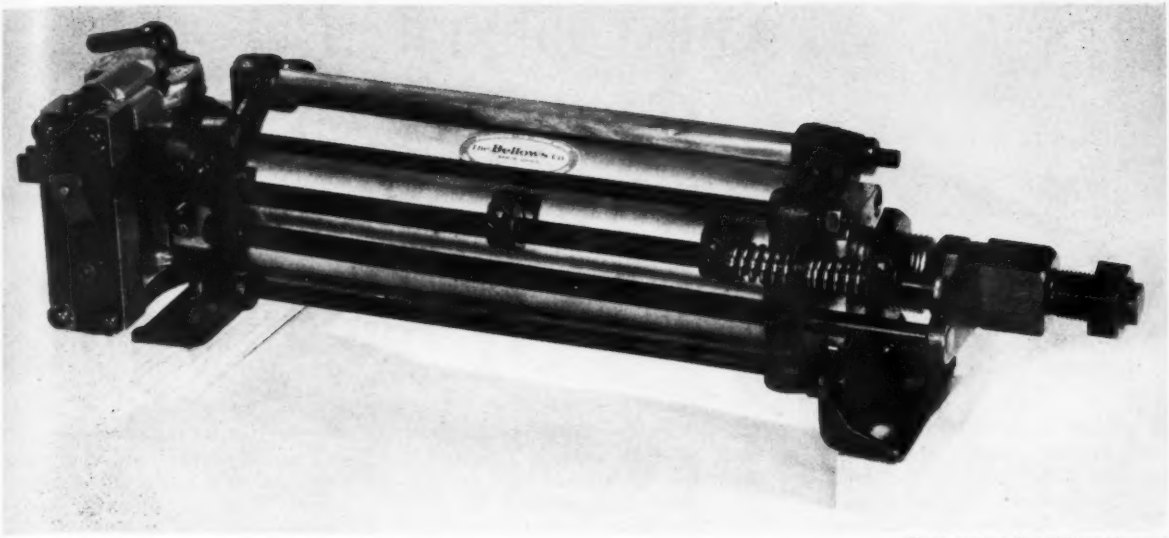


Photo courtesy The Bellows Company

Fig. 3. Air motor (cylinder) integrated as a standard reciprocating unit, single cycle or continuous cycle. Unit pictured is a Bellows BCAME Air Motor.

standard, having been designed for mounting on a manifold or panel whose internal coring or machined channels direct the medium through respective bolted-on valves. More about this at some other time.

Another excellent example of integral design is found in air motors (rotary), either hand operated or mounted. These are available for drilling, screw driving, nut setting, etc.; they have built-in control valves, mufflers, etc. to affect great savings in the areas we have been discussing.

Now a short explanation of the circuitry shown in Figure 2: This "JIC sketch" shows what goes on in the air motor (non-rotating) seen in Figure 3 and stylized in Figure 1.

This air motor incorporates principles of integral control to provide a semi-automatic or fully-automatic power package. It can be controlled from a remote vantage point and doesn't depend on limit switches, dogs, or cumbersome additional apparatus. It works like this:

- No work is being done as circuit is diagrammed in Figure 2.
- Integral cam dogs allow valve 1 (two-way) to be open and hold valve 5 (two-way) closed.
- Solenoid of valve 2 (two-way) is de-energized and spring holds it closed.
- Slide, labeled in Figure 1, is in a position whereby valve 3 (three-way) and valve 4 (three-way) work as shown. That is, line pressure to rod end of cylinder and piston end exhausting.
- In order to start a single cycle (out and back) or a continuous reciprocation, the solenoid of valve 2 must be energized. This will open valve 2, bleeding air to atmosphere through valve 1 which is already open. Bleeding air in this manner will unbalance spool end-pressures shifting it. Slide goes along. The spool is in itself a small piston, with line pressure on both ends. An unbalanced condition must be arranged on one end or the other to shift it.
- With the slide shifted to its second position, we have in effect set up valves 3 and 4 for their second positions. Here line pressure is directed to the piston end of the cylinder and exhausted from the rod end. Piston drives out.
- When piston reaches the end of its "out" stroke an integral cam dog overcomes spring of valve 1, closing it. At the same time, another cam dog holding valve 5 closed releases spring pressure, opening it.
- This again sets up an unbalanced pressure on spool-ends as air is bled through valve 5 to atmosphere. Since passage to atmosphere at other end of spool is now closed, even though solenoid may still be energized, pressure will shift spool. Slide lug in spool takes it along.
- Valves 3 and 4 are again in position shown, and piston returns to start position.
- If solenoid is de-energized after initiating the first out stroke, the piston will return after a complete stroke, and stay. This is due to valve 2 being closed when solenoid is de-energized. When valve 2 is closed, air cannot bleed out in that direction to create the pressure unbalance necessary to shift spool.
- As long as the solenoid of valve 2 is energized, the spool will be shifted at the end of each piston stroke and reciprocate automatically. In order for the operator to be free from holding an electrical contact closed, if constant reciprocation is desired, a timer may be used.
- By the use of a pressure regulator and speed control valves, as diagrammed, the number of cycles per min can be controlled. Speed control valves, by adjustment, meter escaping exhaust for speed of stroke in either direction.

Other features of integral construction accomplished here, besides "built-in memory," are built-in control of stroke distance and the possibility of stopping in the normally advanced position.

This integrated setup can be used to power grinding tables, polishing beads or work holders and milling tables, and for clipping or agitating motions. Further, it might be used for nibbling, forming, bending, or any application where reciprocation is necessary. Programming could be arranged by using a multiple-stage sequence relay. In some of these and in other applications, you might wish to consider a hydraulic check to smooth out the stroke. end

TAPE CONTROL GUIDES WELDING SYSTEM

A NEW MAGNETIC TAPE TRACER welding system has been developed that permits the joining, in a continuous automated operation, of metal parts having untrimmed, out-of-tolerance, straight line, or contour weld line edges. This system, developed by Expert Welding Machine Division, Expert Die and Tool Company, controls self-powered welding heads which automatically follow any type welding contour with a high degree of accuracy.

This is done by having the basic welding head carriage follow the proposed design contour of the part weld line. A mechanical probe mounted through a slide on the welding head carriage follows the actual weld contour line. The movements of the slides are transmitted into a differential whose output then represents the error between the actual and design weld line. This displacement error is then recorded on a loop of magnetic tape where it is temporarily stored.

A reading head, located on the same tape loop a few inches behind the recording head, picks up this error intelligence and feeds it through a simple amplifier and hydraulic valve to a hydraulic servo cylinder. The servo cylinder corrects head position with respect to the welding carriage to correct for the reported error.

Automated welding machines incorporating this electronic magnetic tape tracer system have been built for welding the two channel halves of right and left hand automotive frame siderails (see illustration) and for welding automotive frame crossmembers.

Cams partially guide the welding heads in the vertical direction and totally guide them horizontally. Each welding torch is mounted to its respective carriage through a vertical slide. This permits the head to follow the contour of the welding line on the channel halves in a vertical plane by means of the cam rollers that follow the basic part contour cams.

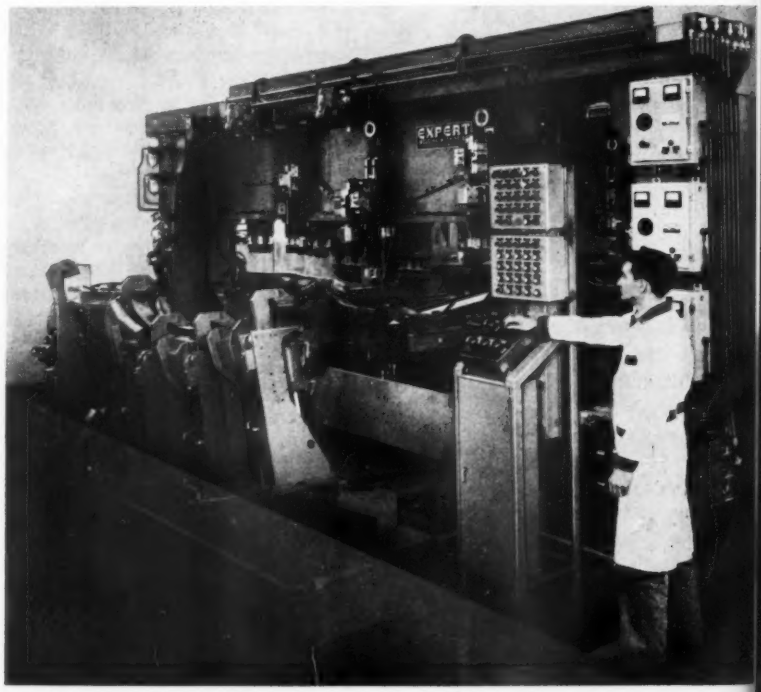
The vertical contour of the channel halves, however, often deviates from print dimensions as much as $\pm 3/16''$ and thus deviates from the contour cam dimensions. In these cases, the Expert magnetic tape tracer system, which compensates for any deviation from the contour cams, takes over and correctly positions the welding torch on the welding line of the channel halves.

To begin welding operations on the right and left-hand frame siderail welding machines, the two 12′-long channel halves of the siderails are manually loaded and then press-assembled with power air clamps.

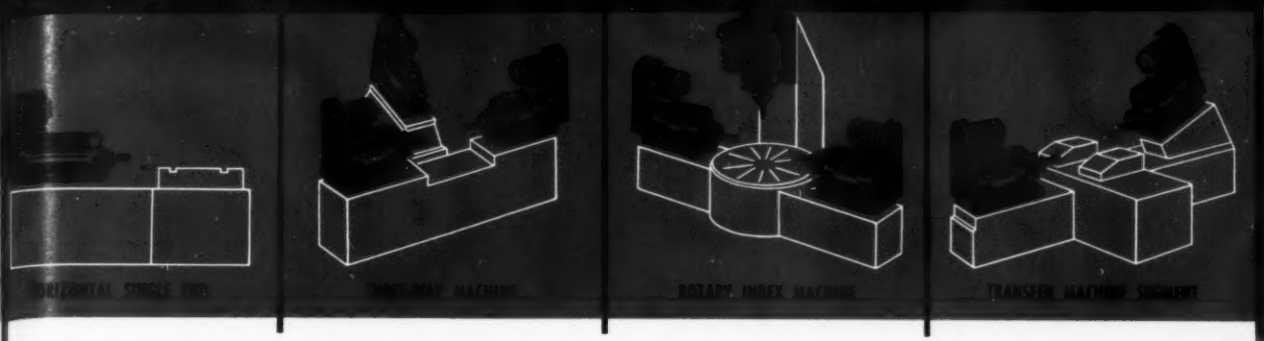
Next they are automatically transferred to the welding station. Hydraulic cylinders raise the transfer mechanism by means of a bell crank-type linkage and move it together with the rails, into the three-dimensional contour welding station and unload stations.

With the platen in the up position and the siderails clamped in place, the six welding heads (three on each side of the part) accurately follow the contour of the siderails — by means of basic part contour cams and the Expert magnetic tape tracer system — and contour-weld the two channel half sections together to produce a completely and accurately welded automotive frame siderail.

end



Tape-controlled Expert welding machine that automatically welds contours of automobile frame siderails.



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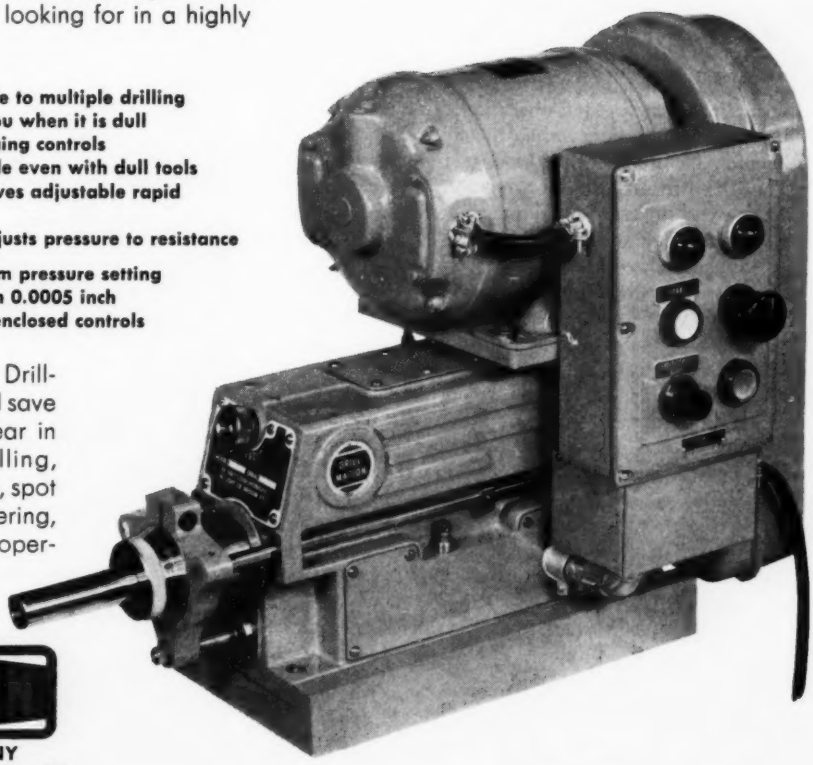

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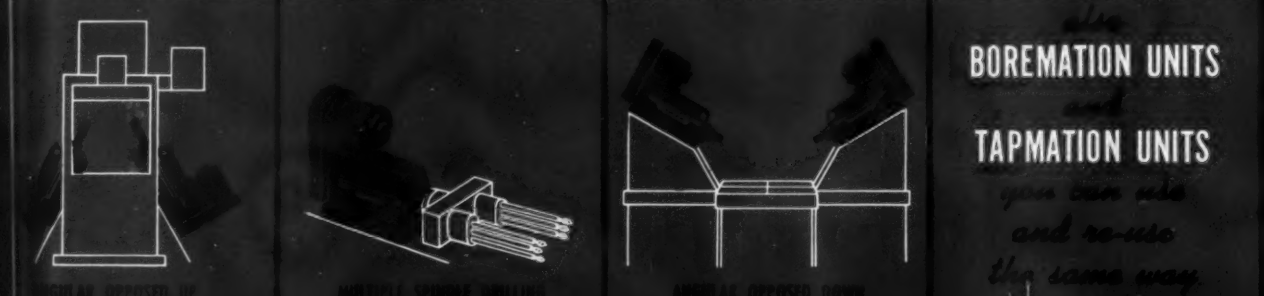

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CIRCLE INFORM-A-GRAM KEY NO. 551

Bill Lenkeit tells why his Jig Boring and Jig Grinding Room is "all-Moore"

This is another in a series featuring the views of owners of leading contract tool and die companies

by **WILLIAM LENKEIT**
President
Lenkeit Machine & Tool Co., Inc.
Farmingdale, L. I., N. Y.
Precision Tooling, Contract Jig Boring and Jig Grinding

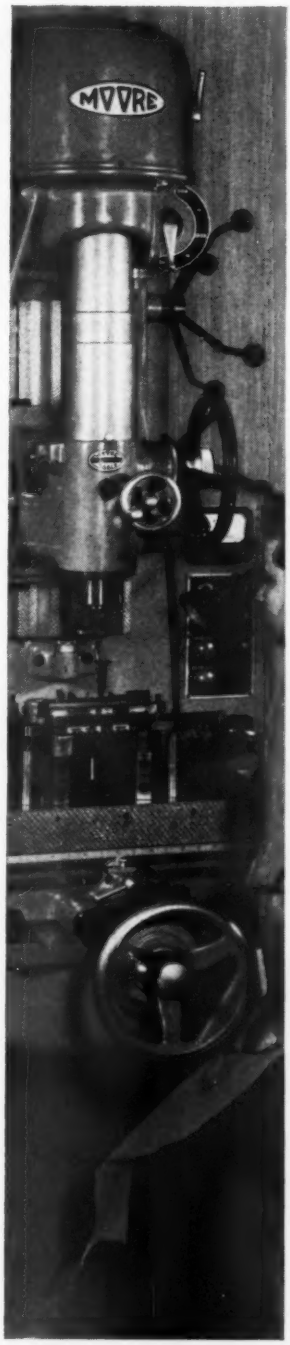
"Like other modern contract plants where close-tolerance work is the rule, we have a special air-conditioned room housing our jig borers and jig grinders. In ours, the nameplate on every machine reads 'Moore.'

"We have always sought to obtain the best possible equipment for each type of operation. That is why our facilities list includes outstanding machines of Swiss and German manufacture, as well as fine American-made equipment. But when it came to jig boring and jig grinding, we found there was no equal to Moore machines for built-in accuracy, versatility and ruggedness.

"We now have three Moore jig borers and one Moore jig grinder, with another borer on order. We use this equipment extensively for operations on the precision dies, jigs, fixtures and inspection gages we build for leading Eastern companies in the instrument, electronics, electrical and printed-circuits fields. We also do a considerable amount of contract jig boring and jig grinding for instrument companies which naturally have close-tolerance requirements.

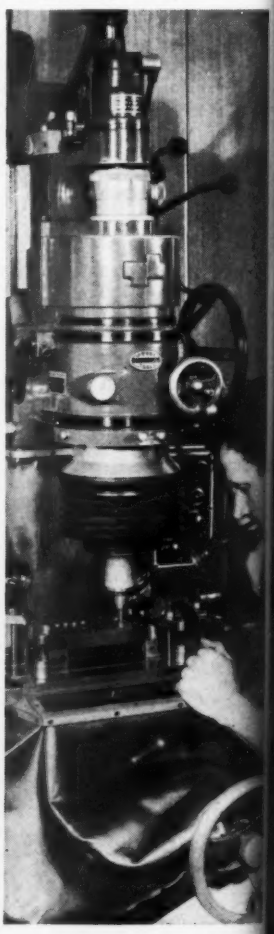
"What do we like best about our Moore equipment? These machines are ideally suited to our day-to-day toolroom work—quick setups, convenient controls and, most important of all, unmatched accuracy. Our machines have been in almost constant use since they were installed and they are just as reliable as ever.

"Our all-Moore facilities for jig boring and jig grinding are a major reason why we can say: 'It pays to tool it right at Lenkeit'."



"One of the three Moore jig borers in our air-conditioned room. They carry the load on our critical spotting, boring, drilling, reaming and checking operations."

"Our Moore jig grinder is one of the key machines in our plant. We especially like its slot-grinding ability."



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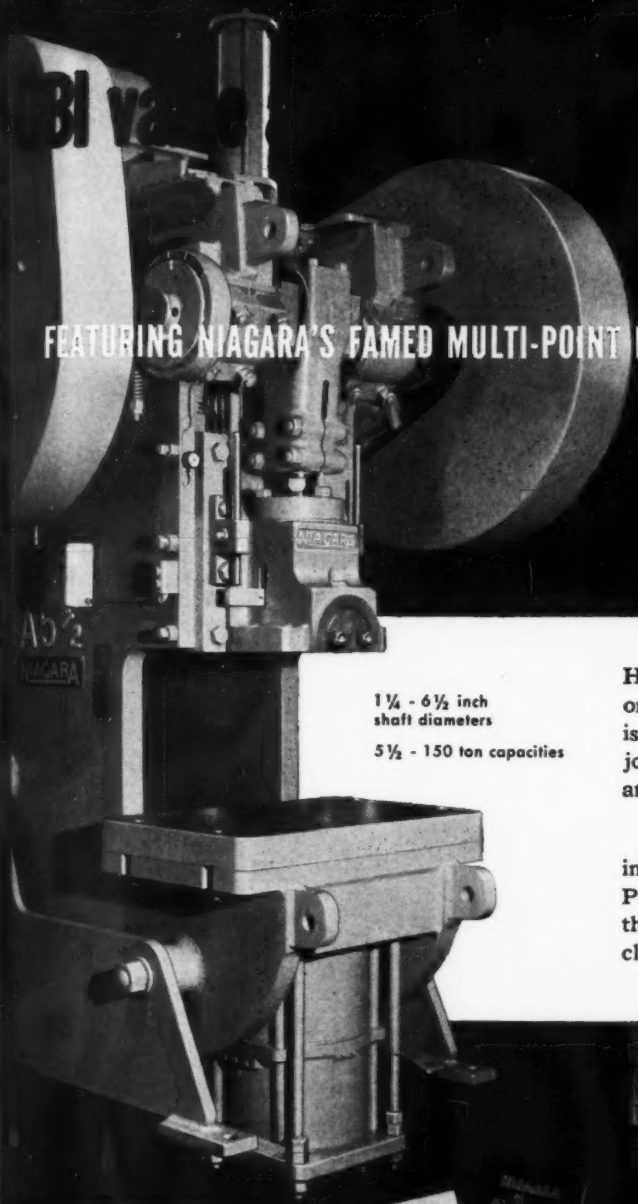
CIRCLE INFORM-A-GRAM KEY NO. 561

TON FOR TON . . . DOLLAR FOR DOLLAR



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1¼ - 6½ inch shaft diameters

5½ - 150 ton capacities

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WITHOUT ONE CENT SPENT ON CLUTCH ENGAGING SURFACES

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NIAGARA

Die Sinking Costs Drastically Reduced by Magnetic Tape Control

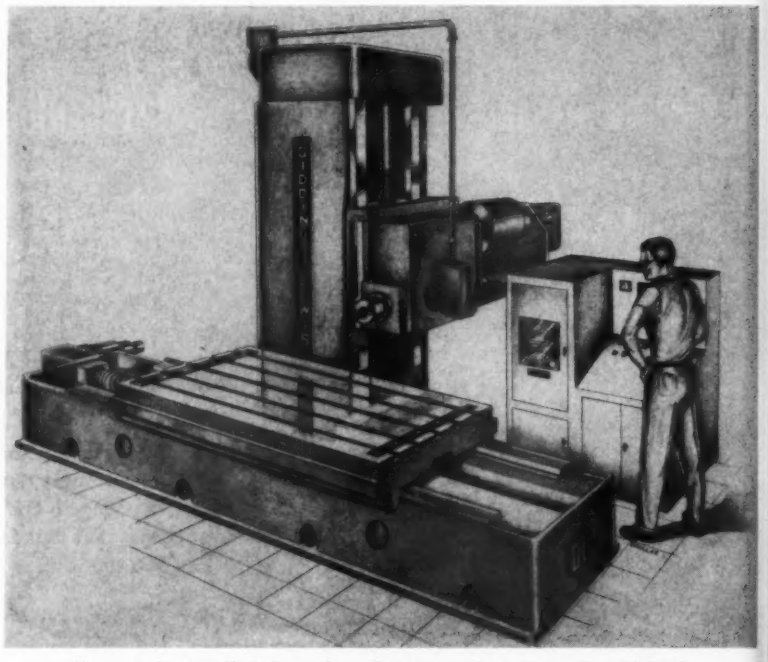
RECENTLY IT TOOK ABOUT HALF as long to produce a large hammer die on the new G & L DiMil numerically controlled miller as it formerly took with conventional template methods. Production, in this case, included complete programming and recording of the tape.

Breaking time figures down, the Giddings and Lewis milling machine with Numericord continuous path magnetic tape control system cut actual machining time 67%. Bench-and-polish time was reduced 62%, due to the improved accuracy and finish obtained. When a duplicate of the first die was machined, savings really mounted up — a 77% reduction in total manufacturing time was recorded.

Under tape control, a DiMil milling machine can be programmed for a wide range of profile milling, including dies, molds, cams, templates, and many prototype and production parts. Manual operation also is provided.

Most work can be handled on one of the six table-type models, featuring moving table and fixed column, the smallest of which has a 36″ x 48″ working surface. Large work, up to the biggest dies in use, can be handled on floor-type machines. On these the column moves and the workpiece is fixed. All machines have quill-type milling heads with 38 spindle speeds from 10 to 1780 rpm.

A decimal readout system is available for all three motions to give an exact indication of cutter position. Horsepower and feed rate meters insure that all cuts are taken at maximum efficiency and provide a guide to the operator as to the condition of tool sharpness. To insure that tools are replaced when necessary, particularly during long cuts, tool change is programmed along with all other machine functions.



Numerical controlled die sinker, that can reduce die and mold lead time and costs by 50% or more.

Actual die milling time under tape may run only ¼ to ⅓ that required with templates and highly skilled operators. Operations are performed continuously; noncutting intervals and single positioning operations are eliminated. Important reductions in setup time are realized and close to optimum speeds and chip loads are maintained at all times. Another advantage is longer tool life with attendant reduction in downtime. Important too, accurate scheduling and pricing are made possible because production time is a known factor when numerical control is used.

Tape controlled DiMil machines provide flexibility to meet a variety of conditions. For example, to rework the draft on a die it is not necessary to produce a new tape. Simply changing to a cutter with a different draft angle will do the job. This is because the tape describes the path through which the center of the tool moves. Another feature of tape control is found in machining forging dies. Shrink allowance can be programmed automatically.

Coming Soon . . .

T&P Spotlights Carbides in February

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the man who needs
a new machine tool is
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Your good ideas . . . how long do they live?

The answer is simple: They live only as long as top management in your company is *convinced* that they will be profitable. The hard part is in the convincing. Particularly when initial capital expenditures are necessary.

Want some help? Our new 16mm. color-and-sound movie, "The Price of Eggs", tells how to move a production idea toward profit. It can be related to methods changes, production volume, new designs, new products, or *any* facet of your operation which deals with keeping manufacturing costs competitively low. And it contains no "commercial". A group showing to your top production and management people will be an eye opener. It's yours—with no obligation.

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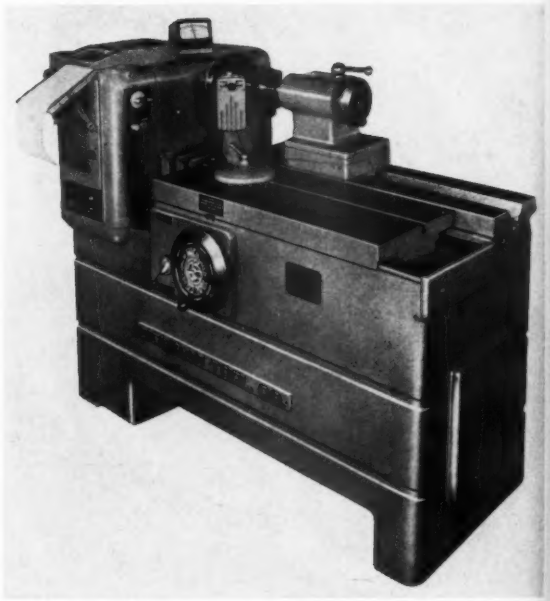
CIRCLE INFORM-A-GRAM KEY NO. 591

BUILT-IN OPTICS SIMPLIFY GEAR CHECKER

PRECISION CHECKING OF THE LEAD OF GEARS has heretofore required great skill and laborious procedures with gage blocks, micrometers, verniers, and gear trains. A recently developed lead-measuring instrument does away with these complications and precisely checks gear leads from zero to infinity. It's so simple to set up that no special training is required of the operator. Calculations are virtually eliminated.

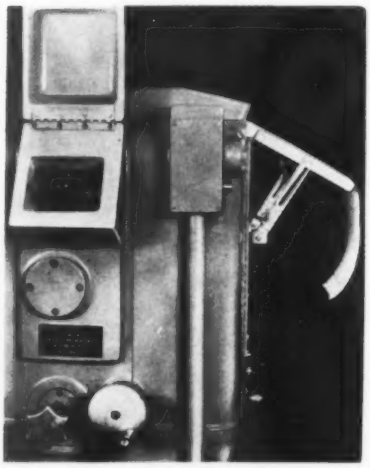
The sine-bar controlled machine, although primarily designed for external and internal helical gears and spur gears, also checks either right- or left-hand leads on herringbones or worms. It has a capacity for gears up to 18" dia with shaft lengths to 24".

A built-in optical system incorporated in this Michigan Tool development is the basis of the new easy-setup method. A 56X microscope with graduated eyepiece, providing an unreversed erect image, is built in over the sine-bar table. Exact-angle location is obtained by aligning cross-hair markings on the scope's eyepiece with the precision-graduated sine-bar plate. The scope and eye-piece divide a degree into 1000 parts. The sine-bar table is rotated manually from a handwheel and is worm gear set. The sine-bar plate is locked in position without deviation from the correct scope setting.



A built-in optical system "lines up" exact angle location of this sine-bar controlled lead-measuring instrument. The unit checks helicals, herringbones, spurs or worms up to 18".

Close-up of the built-in optical system of Michigan Tool's Lead Measuring Instrument. A 56X scope with graduated eyepiece provides the precision reference against which the sine-bar plate is moved.



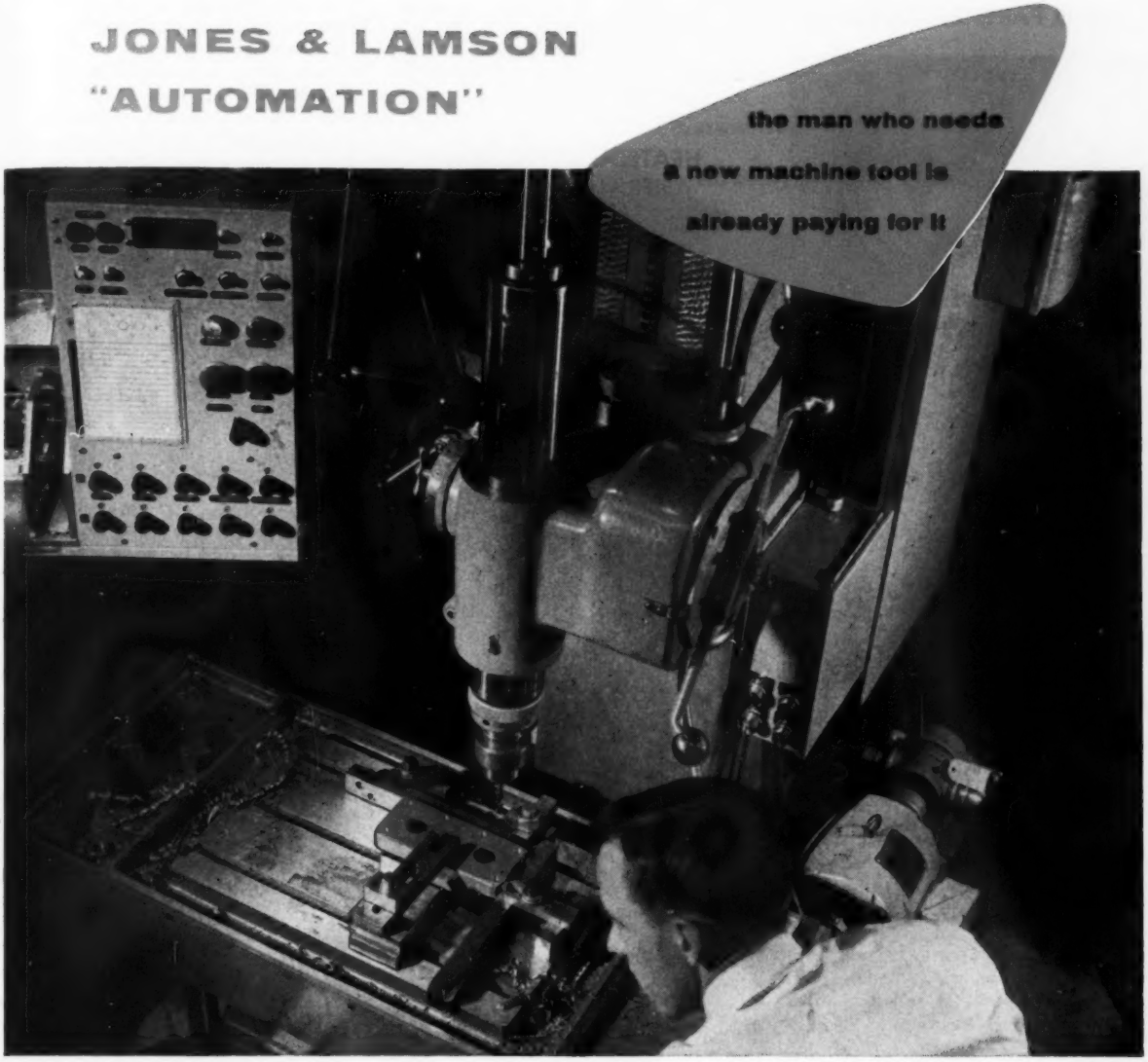
An electronic gage records errors in tooth profile of external and internal spur and helical gears. This unit has a light-load gaging head and high-response amplifier connected to a calibrated meter to visibly indicate lead deviation in increments of 0.0001".

The lead checker includes an integral recording unit to provide a visual record of all checking data. Mounted convenient to the operator for ready reference, it records, in ink, on paper printed in increments of 0.0002".

Michigan's lead measuring instrument can be operated from front or rear. The gear being checked is mounted between centers and the indicator is adjusted so that the contact point is normal to the face of the gear tooth. By turning the handwheel, the indicator contact is brought along the face of the tooth (as the gear rotates in proper relationship due to the sine-bar control). Any deviation on the indicator shows change from specified lead.

The machine's two tables — a sine-bar table and a table carrying the indicator head — move on ball races. The sine-bar mechanism synchronizes movement of the tables and work spindle in correct lead-checking relationship. All operating mechanisms, including the sine bar, are completely enclosed and are tamper-proof. end

JONES & LAMSON
"AUTOMATION"



Numerical control positioning eliminates jigs – saves time

The J&L Numerically Controlled Positioning Table quickly and accurately positions work pieces to an accuracy of ±.001″ — without jigs. And it can do it economically with any lot size down to a single piece.

For instance: in one installation, where precision parts previously had been machined on a conventional spacing table, J&L's new equipment achieved cycle time savings of six minutes per piece and set-up savings of over 116 minutes per set-up, or a total savings of 6.95 hours on a lot of 50 pieces.

In another plant, the cost of building $4,000 worth of jigs was eliminated during the first six weeks of operation. And in still another operation, the positioning table not only reduced set-up and cycle time, but also eliminated the storing, handling and maintenance of $29,000 worth of jigs.

You can get in on this kind of savings too. Write to Jones & Lamson Machine Company, 519 Clinton Street, Springfield, Vermont.

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CIRCLE INFORM-A-GRAM KEY NO. 611

TRANSFER UNITS SPEED AUTO PARTS PRODUCTION

Fig. 1

Two automatic transfer machines — a 31-station unit for machining 378 automatic transmission pumps/hr and a 26-station unit that processes 450 pistons/hr — have been designed and built by F. Jos. Lamb Co.

Both machines feature building-block unitized construction, a walking-beam type transfer mechanism, and fixtures with integral clamping at each work station.

The 31-station transfer machine uses almost every known method for machining of holes and also does plunge face milling with multiple blade cutters. Pump bodies (Fig. 1) are machined from five different angles and three positions. The machine uses three wing-base-supported Lamb standard way-type units designed for heavy thrust milling, drilling, and tapping operations. Light thrust operations are performed by standard quill-type self-contained hydraulic power units. Plate-type work heads make it easy to change hole patterns.

For inspection, the machine incorporates a new idea in probes; removable probes require only one limit switch and can be replaced in seconds by lifting the retainer plate and sliding the probe out of its bushings.

The other Lamb machine (Fig. 2) performs milling, drilling, and boring operations, and probes all drilled holes, as pistons are automatically cycled through 26 stations. It gages all pistons and marks any that are out of tolerance. If three consecutive parts are marked, the machine is electrically stopped.

Fig. 2

HEATED PRESS BONDS AIRFRAME MEMBERS

An unusual hydraulic press has been built for Convair to cut costs in the production of aircraft structural members. The press is used for bonding together pre-blanked thin gauge metal parts to form heavy gauge structural members accurately and inexpensively.

A number of lamination assemblies are set up on the aluminum tool plate outside the press. Then the tool plate is powered into the press over a series of rollers. When the

plate is in position, the rollers are lowered, setting the tool plate onto a hot plate built into the press bed.

The press slide, equipped with a similar hot plate, moves down onto the assemblies, dwells for a predetermined time, then retracts automatically. The tool plate and the new bonded assemblies are removed and a similar tool plate, which has been loaded on the opposite side of the press, moves into position for a new cycle.

The press was built by Clearing Machine Corp., Division of U. S. Industries, Inc., to meet very high requirements for accuracy of bed and slide parallelism so firm bonds can be obtained in the laminations. A water cooled plate is used to prevent heat transfer to the slide and bed so that high temperatures used in the hot plate cannot affect the accuracy of these parts.

CUTTING OIL EXTENDS LATHE TOOL LIFE

Life of cutting tools used for machining strong eccentric crankshafts used in electric paint-conditioning machines has been increased 25% at the Red Devil Tool Co. The former need for tool regrinding after turning 60 pcs, and the formation of rust and bad odor in the operation, have been eliminated by changing over from an emulsifying cutting oil to a heavy duty soluble oil made by Gulf Oil Corp.

The shafts are turned from drop forged AISI 4140 steel on a Fay automatic lathe. Spindle speed is 578 rpm, feed 0.008″, depth of cut 0.100″, and depth of finish cut 0.069″. About 25% of the steel forging is machined away. Use of the proper cutting oil on the hard-to-machine steel keeps the tool and workpiece from overheating and results in longer tool life for the company.

BARREL FINISHING UPS MINIATURE BALL BEARING PRODUCTION

Tiny ball bearing races, some so small that 500 can be carried in a thimble, are now being barrel finished successfully by Miniature Precision Bearings, Inc. Installation of ALMCO precision barrel finishing machines was made to improve surface finish on inner and outer bearing races, as well as to remove burrs, sharp edges, and machining lines.

Removing speck-size burrs left on the inside of bearing races in initial cutting was once a hand operation. Improved machines and techniques, such as precision barrel finishing, now enable one person to do the job formerly requiring four.

Production usually runs from 1,000 to 4,000 parts/load, and occasionally at 5,000 to 15,000 parts/load. Most parts are loaded twice during the production cycle and some are loaded four and five times, depending on the machining and grinding required.

The miniature precision ball bearings have wide application as vital components of servo motors, dentist drills, miniature gear trains, anemometers, differential gears, miniature tape recorders, cam followers, aircraft instruments, and similar products.

JONES & LAMSON OPTICAL COMPARATORS

the man who needs a new machine tool is already paying for it

J & L Comparators produce the sharpest, blackest shadow images

You've often heard the phrase, "There's more to it than meets the eye." This couldn't be truer than when referring to different types of Comparator performance. Screen illumination on J & L Comparators doesn't just *appear* to be brighter—it *is*. Prove it to yourself with a light meter. While doing this you'll find that J & L not only *produces* more illumination—but also *stops* more. Shadow images (which is what we really measure or inspect) are sharper, denser and distortion-free.

And here's something else; J & L Comparators are now being equipped with a NEW VARIABLE LIGHT INTENSITY switch, with built-in filament warm-up. Projection lamp life is materially increased as controlled screen illumination with maximum brilliance is assured. Illumination is reduced when using low magnification lenses and is increased for the higher power lenses. Light potential is used only as required, and lamps last longer.

Write for catalog 5700, which describes many features resulting from J & L's continuous research in optical inspection. Jones & Lamson Machine Company, 519 Clinton Street, Springfield, Vermont.

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CIRCLE INFORM-A-GRAM KEY NO. 631

NEW CRANKSHAFT GAGE SPEEDS INSPECTION

Three sizes of diesel crankshafts, with up to 47 dimensions and conditions on a part, are inspected by one operator with a multi-dimension Precisionaire gage, designed and built by The Sheffield Corp.

Two sets of interchangeable adjustable plate-type tooling together with hand-type Airsnaps accommodate the three crankshaft sizes. Acceptable dimensions are instantly shown during gaging by the position of the floats in the 34 column instrument. Floats stay within the minimum and maximum tolerance lines enscribed on the plastic Airechart running across the face of the instrument, if the part is good. When any floats position above or below tolerance lines, out-of-tolerance dimensions are indicated.

WELDMENT CLEANING TIME REDUCED TO 10% OF FORMER METHOD

Cleaning weldments by hand chipping and grinding was found to be excessively time consuming by the Joy Manufacturing Co., builders of mining machinery. After a careful study of the problem, Joy installed a 96" Wheelabrator Swing Table as the logical solution.

Now the swing table handles the entire plant production in six hrs/day or 30 man-hrs/week. The former grinding and chipping operation required a bare minimum of 280 man-hrs weekly, and sometimes as many as 360. Labor savings are running in excess of $400/week, according to Robert Snyder, Methods Engineer at Joy. The illustration shows a typical load of various parts cleaned on the Wheelabrator 96" Swing Table.

PROPER MACHINE LUBRICATION TIES INTO COST CUTTING

Improved efficiency and economy of machine tool operations are being realized at Electrical Motors, Inc., following a study of cutting fluids, coolants, central lubricating system oil, way and stamping press bearing lubricants, and steel blank coatings.

The plant had used a conventional soluble cutting oil, mixed in a 10-to-1 (water-to-oil) ratio, on a Milwaukee milling machine cutting keyways in various motor shafts. By adopting a heavy duty soluble cutting oil, developed by Gulf Oil Corp., that can be mixed with water in a 35-to-1 ratio instead of 10-to-1, the plant has realized several advantages of economy and improved machine tool performance.

The plant had used a conventionthe Gulf 35-to-1 mixture have doubled the tool life on the milling machine, and the thin, but durable, anti-weld film formed between the tool and chips permits holding closer tolerances on critical cutting jobs. Service life of this mixture is three months in contrast with three weeks that the conventional oil lasted.

In another operation, a dual-spindle Pratt & Whitney machine simultaneously drills two shafts having hole diameters ranging from $1\frac{1}{32}$" to $1\text{-}\frac{9}{16}$", varying in length up to $25\frac{9}{16}$". Principle problem here was heat. Experience proved that Gulfcut 41C, a sulfo-chlorinated fatty oil, had the required properties to cool the work, save the cutting edges of the tool, and remove the chips. The oil is circulated through the system at 40 gpm at 200 lbs psi.

Central lubricating systems force-feed Gulf Harmony 97 oil to all important parts of three high production 150-ton stamping presses. This practice is a protection against bearing failure which could mean expensive lost time for replacement. The presses pierce rotor laminations for U. S. Motors. Blanks are fed automatically by a hydraulic magazine which uses Gulf's Harmony 53 as the hydraulic medium.

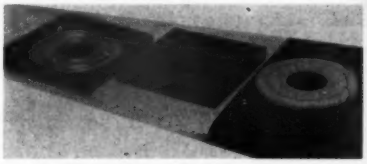
The laminations are stamped from 26-gauge silicon steel blanks. These are coated with Gulfcut 11A before the operation to keep the multiple-punch piercing dies sharp. This is a non-staining, non-corrosive mineral lard oil that gives excellent protection and long life to tools subjected to the extreme abrasive action of the silicon steel.

If the way lubricant on a heavy-duty horizontal boring machine used at the firm, gummed or otherwise deteriorated, it might result in misalignment of the main spindle which in turn, could affect tolerances of the stator frames being bored, faced, and registered. Gulfway 52 has shown successful performance in such boring machine way protection.

NEW CASTING METHOD SLASHES COSTS OF HI-TEMP TOOLING

Low cost ceramic tooling suitable for operation at temperatures up to 3000° F is now being produced by a simple casting technique using Sur-Braze Grade S-2 ceramic.

The illustration shows the simple method of fabricating Sur-Braze S-2 cast hi-temp tooling, developed by Duramic Products, Inc. From an aluminum master of the finished tool, a plastic mold is formed, and into this negative the S-2 ceramic slurry is poured. After setting, the finished casting is heat treated at a temperature slightly above its required operating temperature, and is then ready for use.

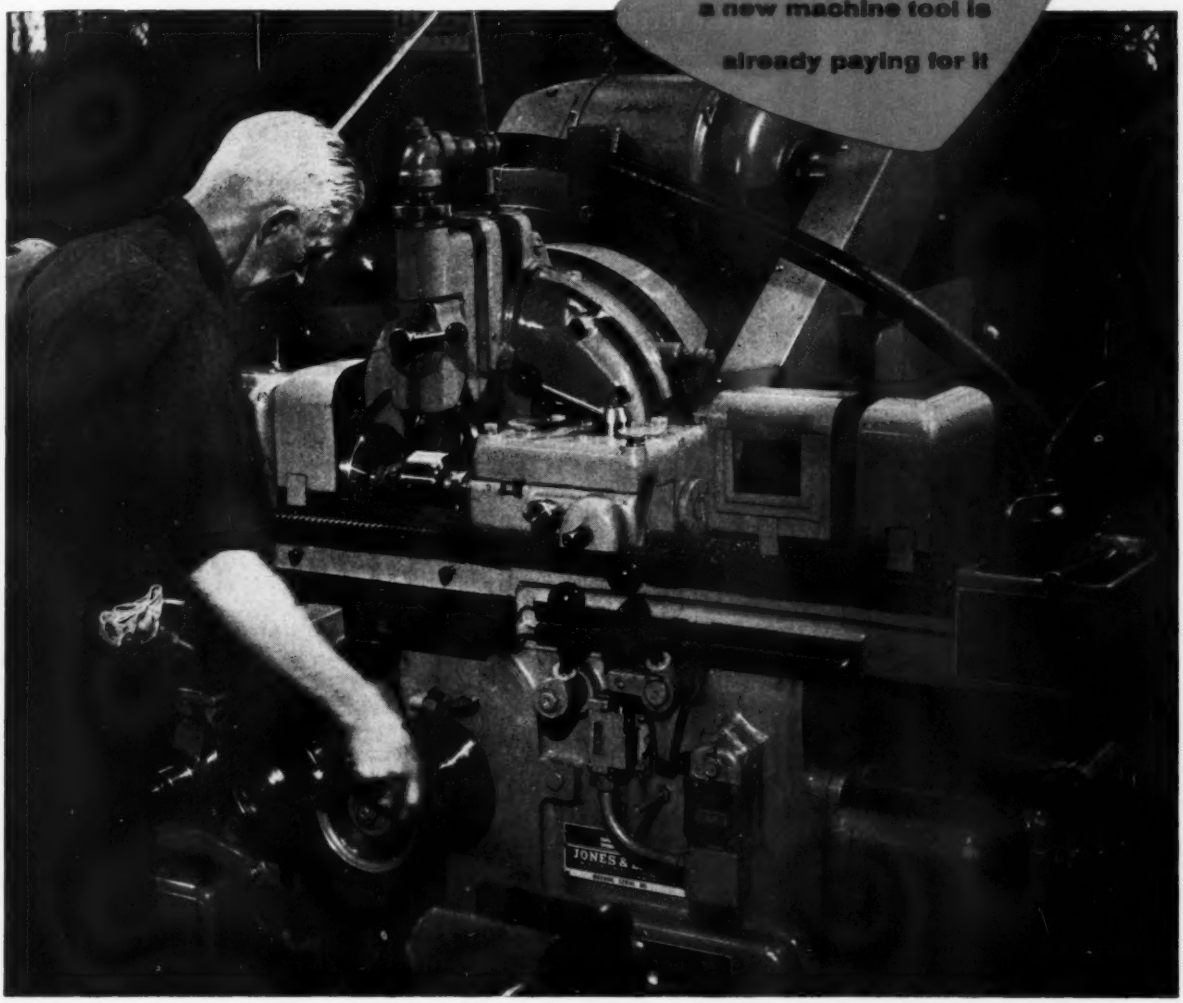


The Sur-Braze S-2 tool illustrated was used as a hi-temp brazing fixture by an aircraft engine manufacturer in brazing shroud and vane assemblies. The ceramic casting cost $21.00 compared to $435.00 for a machined alloy steel fixture, which would, incidentally, out-weigh the ceramic by three-times.

In addition to lower fabricating costs, Sur Braze S-2 cast tooling has drastically reduced lead times in producing tools. The material's low thermal expansion rate also assures less warpage and closer dimensional stability compared to metallic fixtures.

JONES & LAMSON
MACHINE TOOLS

the man who needs
a new machine tool is
already paying for it



Close Tolerance Tool Room Work on an Automatic machine with Universal Application

A customer writes: "The versatility of Jones & Lamson Thread Grinders is scarcely tested in the conventional production of hobs, taps, gages and threaded parts. In our toolroom, using the thread grinder as a basis for 'Rube Goldberg' development, we have produced precision racks, small form-profiled milling cutters, oil grooves and grinding wheel crushers.

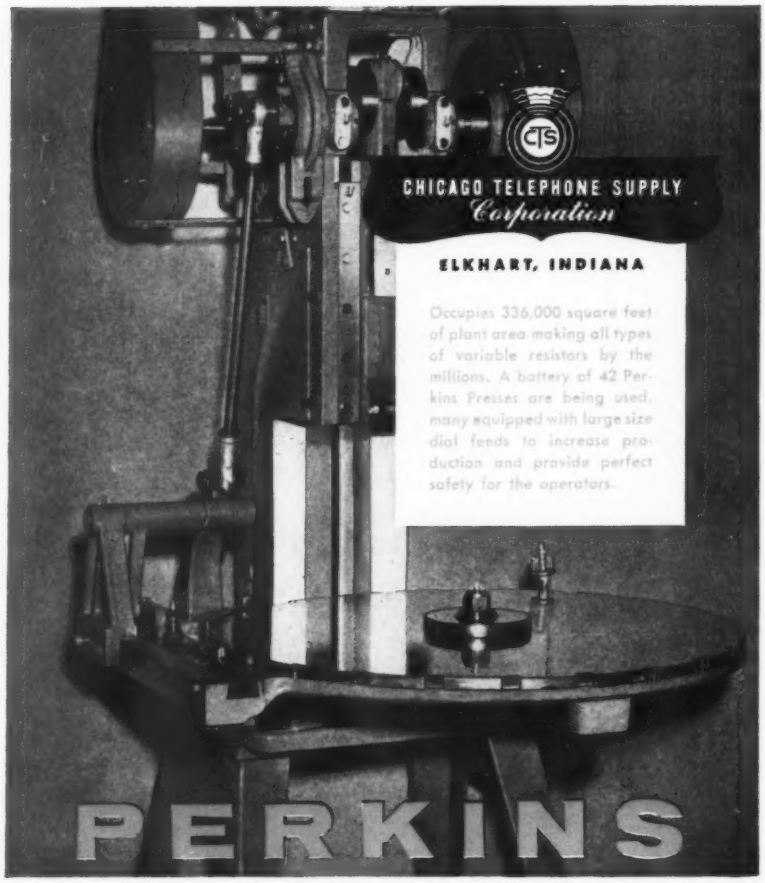
"While serving the purpose as a necessary piece of equipment, this machine also provides a means by which many additional production problems can be explored and tested. Applying the thread grinder to toolroom problems is putting the best foot forward for quickly producing accurate and dependable shop accessories."

* * *

Write for catalog 600. Jones & Lamson Machine Company, 519 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

CIRCLE INFORM-A-GRAM KEY NO. 651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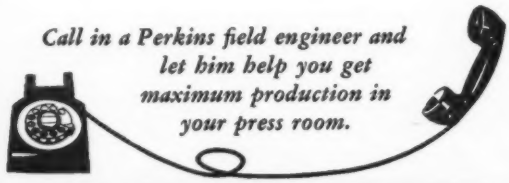
CHICAGO TELEPHONE SUPPLY
Corporation
ELKHART, INDIANA
Occupies 336,000 square feet of plant area making all types of variable resistors by the millions. A battery of 42 Perkins Presses are being used, many equipped with large size dial feeds to increase production and provide perfect safety for the operators.
PERKINS

PRESSES

have been selected because of the infinite precision necessary in the fabrication of all their component parts. For over half a century manufacturers throughout the nation have depended on Perkins Presses to speed production, assure accuracy, prolong die life and hold down maintenance cost.

Call in a Perkins field engineer and let him help you get maximum production in your press room.



PERKINS
MACHINE COMPANY
WARREN, MASS., U. S. A.

Write Dept. TP-5 for complete Technical Information.

CIRCLE INFORM-A-GRAM KEY NO. 661

MEN YOU SHOULD KNOW

Taking over as manager of the product development department for the Wickwire Spencer Steel Division of The Colorado Fuel and Iron Corp. is **James H. Richardson.** He formerly served as a contact metallurgist for the company's general wire sales department in Buffalo.

George W. Brunner, vice president in charge of sales and engineering, has been named to the board of directors of Bernco Engineering Corp. Also announced recently was the appointment of **E. F. Winterfeldt** as plant manager, responsible for manufacturing operations, plant maintenance, purchasing and material control.

Advancement of **Robert F. Meyers** to assistant plant manager in charge of operations for the Bay Mfg. Division of The Electric Auto-Lite Co.'s General Products Group, was made known recently. He previously was manager of manufacturing facilities and methods at the Bay City, Mich., plant.

Allegheny Ludlum Steel Corp. announces that the new manager of the Brackenridge (Pa.) Works is **F. Gordon Benford,** and the West Leechburg (Pa.) Works, **W. R. Yingst.**

Sharon Steel Corp. has announced the appointment of **Robert W. Keenan** as manager of production planning and control. Formerly assistant manager, he will supervise the systems and procedures used in processing cutomer requirements.

Two engineering appointments have been announced by the Federal Pacific Electric Co. They are **Dr. Andrew A. Halacsy,** staff development specialist, and **Gordon O. Perkins,** manager of the company's Development Enginering Department, Eastern Switchgear Division.

New plant manager of the Cincinnati Division of Bendix Aviation Corp., is **Marvin E. Waspe.** He is responsible for the operations of the manufacturing, quality control, and purchasing departments of the division.

Heading the Engineering Metallurgical Department of Dana Corp. as chief metallurgical engineer is **Wilson T. Groves.**

Russel M. Fellows, vice president and treasurer of The Fellows Gear Shaper Co., has been elected to serve as chairman of the board of directors.

. . . . **Continued on page 70**

51% More Production

when drilled with the

BENCH MODEL BURGMASTER
Turret Drilling Machine

JOB DATA:

Part: Gas furnace pilot burner head.

Location: General Controls Co., Glendale, Calif.

Material: Type 2202 stainless steel.

Operation: Drill 10 holes No. 56 drill size.
Drill 1 hole No. 42 drill size.
Drill 1 hole No. 37 drill size.

All hole positions indexed radially around jet axis. Turret is double tooled.

Former Method: Production—58 pieces per hour, standard, on a 3 spindle gang drill. Fixture was progressively moved from one spindle to the next on 8' table.

Burgmaster: Production—88 pieces per hour, standard, with actual production running 130% over standard. Operator fatigue greatly reduced. All holes now drilled from one operator position on a stationary rotating fixture. Floor area requirements per machine reduced 50%. Based on savings alone this machine paid for itself in less than 5 weeks!

Paid for itself out of savings in less than 5 weeks!

THE BURGMASTER TURRET DRILLING MACHINE speeds all second operations—*center drills, drills, reams, taps, spot-faces, countersinks,* and *counterbores!*

SELF-INDEXING—Turret instantly power-indexes to successive station after each individual operation is completed!

6 STATIONS—Only one live spindle! Each spindle operates at its own predetermined speed. Two complete ranges cover 350 to 6200 rpm.

¼" CAPACITY IN STEEL—Larger hole sizes in softer materials.

For *more* parts per hour, for *lower* costs, put your second operations on a BENCH MODEL BURGMASTER TURRET DRILLING MACHINE! Here's a tool that not only produces more parts faster...it costs *far less* than conventional equipment often used for the same job! Write for circulars and specifications!

Want to see the Burgmaster in action? We'll arrange a free demonstration in your plant upon request!

BURGMASTER BENCH MODEL 6 SPINDLE AUTO INDEXING TURRET DRILL & TAP MACHINE

BURGMASTER CORPORATION

Small Tool Division • Burg Tool Manufacturing Co., Inc.

13226 S. Figueroa St., Box 311, Gardena, Calif. • Phone: FAculty 1-3510

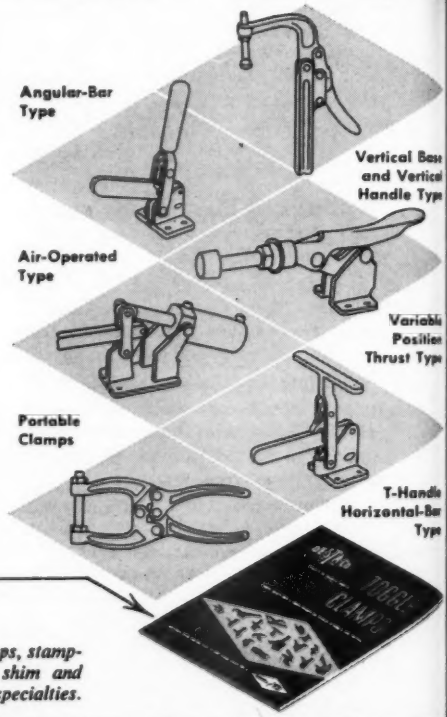
Dept. TP-1

Where It's Quality, Quality, Quality! It's Quality DE-STA-CO Toggle Clamps

FINAL INSPECTION OF ROSS OPERATING VALVES subjects every valve to a pressure test far exceeding its normal usage. For over fifteen years, fixtures similar to this, all employing De-Sta-Co No. 620 plunger clamps, have been built to do this critical high pressure sealing job.

Whether your holding and clamping operation is inspection, machining, tapping, grinding, welding, bonding or other assembly, there is a specific De-Sta-Co Toggle Clamp to do it better. Fast action, positive clamping, long life through thousands of production operations have made De-Sta-Co known for almost 30 years as the leading tool in the field. And every one of our 120 models uses hardened serrated pins in hardened bushings staked to prevent wear. A broad selection of spindle accessories increases the versatility of the clamp you specify.

Our representative in your area is qualified and ready to serve you. Send for our 40 page catalog showing clamp applications, scale drawings and complete information.



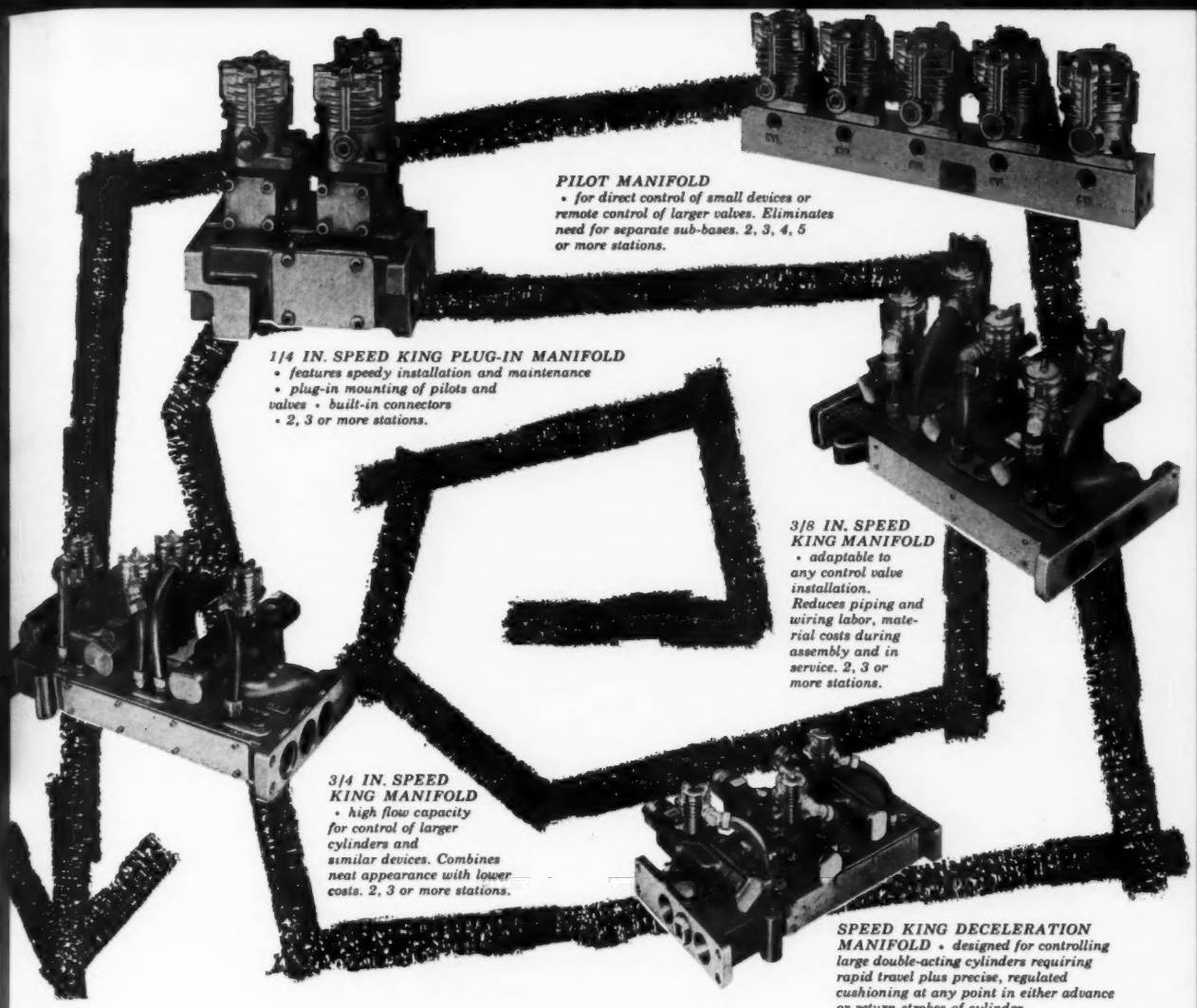
DE-STA-CO

ORIGINATORS OF PRODUCTION CLAMPING

De-Sta-Co is widely known for toggle clamps, stampings, precision washers, spacers, shims, shim and feeler stock, blower housings and marine specialties.

DETROIT STAMPING COMPANY

344 MIDLAND AVENUE • DETROIT 3, MICHIGAN



PILOT MANIFOLD
• *for direct control of small devices or remote control of larger valves. Eliminates need for separate sub-bases. 2, 3, 4, 5 or more stations.*

1/4 IN. SPEED KING PLUG-IN MANIFOLD
• *features speedy installation and maintenance*
• *plug-in mounting of pilots and valves* • *built-in connectors*
• *2, 3 or more stations.*

3/8 IN. SPEED KING MANIFOLD
• *adaptable to any control valve installation. Reduces piping and wiring labor, material costs during assembly and in service. 2, 3 or more stations.*

3/4 IN. SPEED KING MANIFOLD
• *high flow capacity for control of larger cylinders and similar devices. Combines neat appearance with lower costs. 2, 3 or more stations.*

SPEED KING DECELERATION MANIFOLD • *designed for controlling large double-acting cylinders requiring rapid travel plus precise, regulated cushioning at any point in either advance or return strokes of cylinder.*

simplify piping . . . cut installation and maintenance costs . . .

use VALVAIR MANIFOLDS

. . . sizes and types for every application

Save space . . . save assembly time . . . save on piping and wiring material costs . . . improve machine appearance . . . up-grade reliability by eliminating unnecessary connections . . . specify Valvair manifold mounting for your multiple control valve installations.

Easy unit replacement speeds in-service maintenance, too . . . slashes machine down-time. Manifold sizes range from 1/4 to 1 inch NPT . . . in types and combinations *exactly* suited to your requirements. Valvair Corporation, 454 Morgan Ave., Akron 11, Ohio.

AA-8905

- **economical multiple mounting**
- **common inlet and exhaust ports**
- **bench wiring reduces installation time**
- **manifolds can be ganged to mount 2, 3, 4, 5, 6 or more valves**

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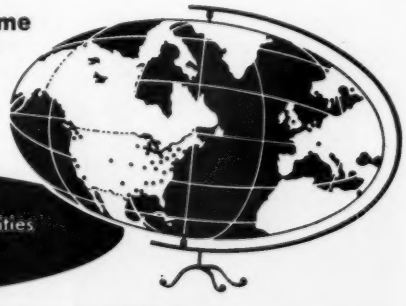
SALES AND SERVICE FROM LOCAL STOCK

Representatives in principal cities throughout the world



DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION

Plants in Akron, Ohio; Canton, Pennsylvania; Birmingham, England; Amersfoort, Holland

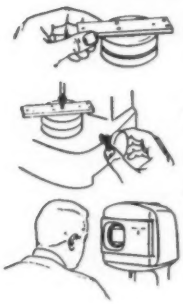
CIRCLE INFORM-A-GRAM KEY NO. 691

New! BAUSCH & LOMB DR-25 OPTICAL GAGE

Direct scale reading to .0001" ...

0" to 3" range ... accurate to .000025"!

FAST, EASY AS A-B-C!



A Just set part to be measured on anvil ... no masters or set gages needed. Large work table makes it easy to adapt special fixtures, accommodates widest variety of work.

B Turn knob to lower spindle ... it will stop automatically on contact, with constant spindle pressure.

C See precise measurement at a glance ... direct-reading scale is illuminated, magnified. No eyestrain, no conversion, no guesswork. Dependable measurement of depth, thickness, height, diameter, taper, angularity of surfaces, runout.

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BAUSCH & LOMB SINCE 1853

CIRCLE INFORM-A-GRAM KEY NO. 701

... MEN from page 66

Raytheon Mfg. Co.'s Receiving Tube Division has appointed **George Loomis** as manufacturing manager.

The Warner & Swasey Research Corp. has just been made the new Control Instrument Division of The Warner & Swasey Co. It's under the direction of Manager **W. S. Tandler.**

The Oberg Mfg. Co., Inc. has announced the following promotions: **Clyde E. Smith,** plant manager; **John C. Vecchi,** assistant plant manager; **Edward S. Hilty,** sales manager; **Claude V. Schrecengost,** assistant sales manager; **Carleton E. Wagner,** chief engineer; **Edward Klemzak,** toolroom superintendent; and **Leslie T. Wohlin,** assistant chief engineer.

Taking over as vice president in charge for Gear Grinding Machine Co. is **Fred F. Miller.**

Appointment of **Elbert R. Faust** as works manager, and **Samuel W. Chantler** as director of research and development, for The Allen Mfg. Co. was announced recently by the company.

Herbert H. Upton and **Thomas Hollis Jr.,** were recently elected vice presidents of the Brown & Sharpe Mfg. Co. Upton continues as general manager of the Hydraulics Division and president of another subsidiary, Double A Products Co., while Hollis remains general manager of the Cutting Tool Division and president of the Nelco Tool Co.

R. T. Eakin has moved into the position of vice president of operations at Latrobe Steel Co.

Clearing Machine Corp., Division of U. S. Industries, Inc., names **Gordon M. Sommer** vice president in charge of engineering. He previously served as director of research and development at Clearing for two years.

The board of directors of the Worcester Pressed Steel Co. recently named **Maynard F. Carter** vice president. In addition to his responsibilities as secretary and comptroller, he'll supervise company plant activities.

Former vice president and general manager **Steven S. Gordon** has been named president of Republic Gear Co. by the board of directors.

Election of **Donald R. Spotz** as president and general manager of the Pesco Products Division and the Wooster Division of Borg-Warner Corp. was announced recently. He formerly served as the division's vice president in charge of sales.

BETTER CARS ARE BEING BUILT

New

Henry & Wright Double-Crank Dieing Machines Produce More Parts Faster . . . More Accurately

150 ton Henry & Wright, one of ten installed by a leading automobile manufacturer in the Flint area.

Die operations on a hood bumper bracket. After the neck of the part has been freed, the work is advanced by a single tab and a carrier strip.

Stamped parts of today's cars must be produced rapidly and in quantity, but they must also be held to close tolerances of accuracy. Henry & Wright machines are now offered in a new double-crank design. The crosshead is supported on both sides of the die so that the tools close in perfect alignment even with severe off-center loads. Thus, parts are more accurate and uniform . . . die life is greatly extended. Because machine design permits quick and easy die change, non-productive time is reduced to a minimum.

Handling more jobs—faster—and to required accuracy tolerances—makes the H & W machines an integral part of automation processes for any plant. These machines are truly the result of "pooled ideas" from the automotive field and from experienced H & W engineers.

Send today, for complete information on these new and proven production profit makers. Build your new production around Henry & Wrights—they're made by H-P-M, you know, a leader in metalworking processes since 1877.

H-804

THE HYDRAULIC PRESS MFG. COMPANY

A DIVISION OF KOEHRING COMPANY • MOUNT GILEAD, OHIO, U.S.A.

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NEW

LO-CARB

precision ground flat stock

for greatest accuracy and smoothest finish

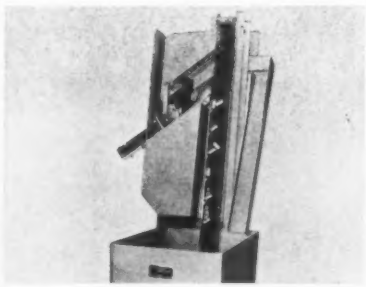
See Your Capewell Distributor

CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.
CIRCLE INFORM-A-GRAM KEY NO. 721

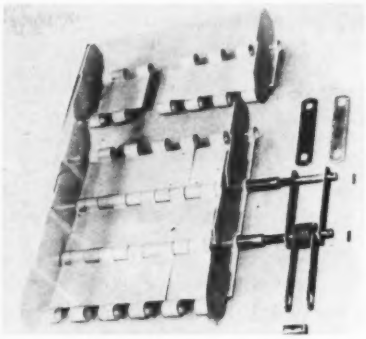
Products & Processes

PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS



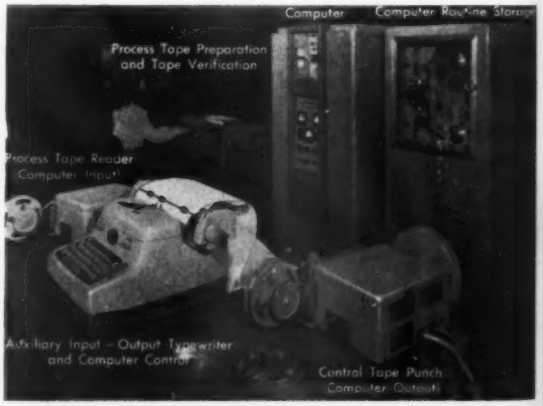
"Color Code System" is a booklet which gives materials, ideas, and a color code chart to make steel bar stocks or other stocks more easily identifiable. Paint in aerosol cans can be quickly applied and this method reduces labor costs. Get a copy from Crown Industrial Products Co., Dept. TPC, 1003 Amsterdam St., Woodstock, Ill., or Circle Inform-A-Gram No. A1.

Easily Handle Scrap with this new conveyor that eliminates clogging, wedging, and spilling. The Hinged-Pan conveyor has closely fitted pan joints which leave no



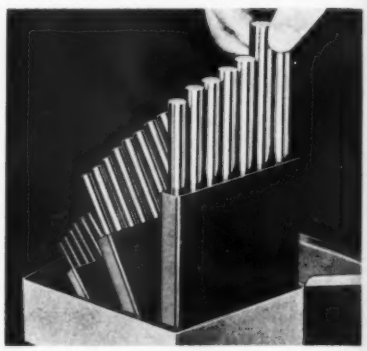
opening, and mechanical wear during operation is restricted to two easily replaceable parts. Gifford-Wood Co., Hudson, N.Y., or Circle Inform-A-Gram No. A2.

This Numerical Control Tape Preparation System automatically prepares control tapes for two- or three-dimensional contour machining of parts like intricate cams, molds, forging and stamping dies, templates and forged fittings. Get details from the Industrial Controls Section, Bendix Aviation Corp., 21820 Wyoming Ave., Detroit 37, or Circle No. A3.


Computer
Computer Routine Storage
Process Tape Preparation and Tape Verification
Process Tape Reader Computer Input
Auxiliary Input – Output Typewriter and Computer Control
Control Tape Punch Computer Output

Compact Size and self-contained drive are features of this Feedall high speed parts feeder. Model 2200-C is completely automatic and feeds sliding parts ⅛″ to 1″ dia from ½″ to 3″ long, rolling parts ⅜″ to 3″ dia and ⅛″ to 1″ thick. Feedall, Inc., 38399 Pelton Rd., Willoughby, Ohio, or Circle Inform-A-Gram No. A4.
←

Close Tolerance Limits over the 0.0135″ to 1″ dia size range is a feature of the expanded line of hardened and ground high speed steel drill and reamer blanks announced by the Ace Drill Corp., Adrian, Mich.



They're ideal for use as knockout pins, punches, dowel pins, and plug gages for high temperature applications. For information, write the company, or Circle Inform-A-Gram No. A5.

Precision Clamping and Chucking of workpieces with cylindrical clamping surfaces is possible with Ringspann discs. A bulletin includes dimensional drawings which show applications. Request a bulletin from Karl A. Neise, 404 4th Ave., New York 16, or Circle Inform-A-Gram No. A6.

save machining costs with this versatile new tool

only $565
BASIC UNIT
F.O.B. RACINE

DUMORE VERSA-MIL®

MILLS · BORES · SHAPES
SLOTS · GRINDS · DRILLS

... anywhere!

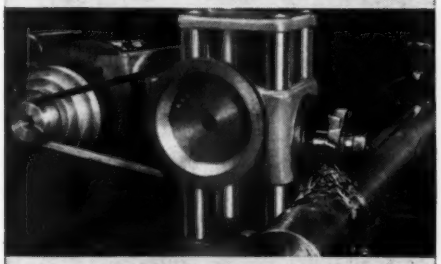
● Compact, rigid, portable, this *new* machine efficiently performs in any position, as an independent unit with its own power and feeds, or added to machine tools—lathes, planers, shapers, millers, grinders. Saves handling, moving, set-up and down time.

Gives close tolerance, quality results while removing metal at *profitable* rates. Adapts quickly to standard machines, fixed machinery in place, pieces in fixtured set-ups, or on parts too big for standard machines. By taking Dumore Versa-Mil to the work, it gives you the advantage of machining where it is most economical!

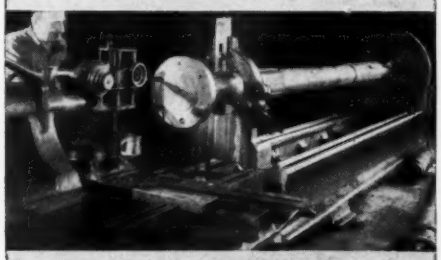
For Maintenance, Job Shop, Tool Room and Production Uses

MOUNTS ON ANY MACHINE TOOL

Milling 5" Keyway on a Planer



Slotting 42"-Long on a Lathe



Boring and Drilling on a Lathe

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You Can Do More with DUMORE

All-Purpose Precision Metalworking Tools

THE DUMORE COMPANY • 1304-A Seventeenth Street, Racine, Wisconsin

Versa-Mil • Drill-N-Tap Units • Drilling Units • Drill Heads • Micro-Drills • Drill Grinders • Precision Grinders • Hand Grinders • Flex-Shaft Tools • Quills and Accessories

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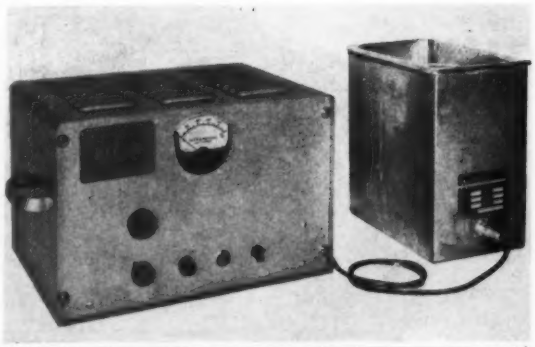
CIRCLE INFORM-A-GRAM KEY NO. 731

Products & Processes

PRODUCTS & PROCESSES & PRODUCTS

An Ultrasonic Cleaner for laboratory or production use handles small parts cleaning, blind hole washing, and printed circuit cleaning. It features two cleaning tanks that can be used alternately without disconnecting either one. Get literature from Alcar Instruments, Inc., 17 Industrial Ave., Little Ferry, N.J., or No. A7.



LEMPCO STYLE "M" and "L" DIE SETS

NEW

ALL-STEEL

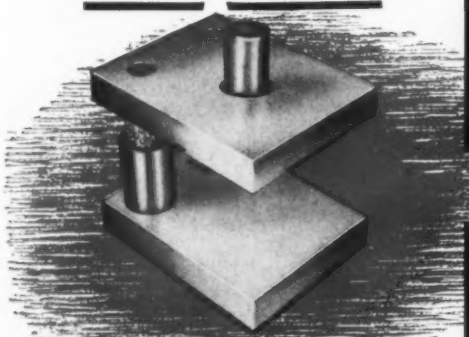
DIE SETS AT THE PRICE OF CAST IRON!

BALL-BEARING ANTI-FRICTION PIN BUSHINGS

EASIEST AND FASTEST TO ASSEMBLE OR DISASSEMBLE

PRECISE ALIGNMENT FOR MILLIONS OF STROKES

ZERO MAINTENANCE; ONLY CUP GREASE AT GRINDING TIME



NOW, Lempco's line of Precision Ball-Bearing Die Sets, includes new low-priced *all-steel* sets, Style "M" and "L", at the price level of *friction-type cast iron* die sets. Better write TODAY for New Low Prices!

LEMPCO INDUSTRIAL, INC.

DUNHAM RD., BEDFORD, OHIO

WHERE QUALITY CONTROLS!

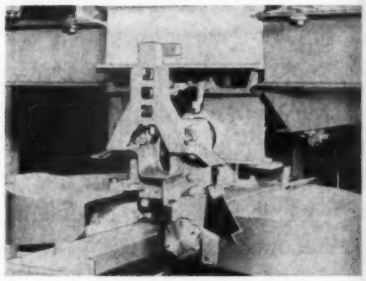
CIRCLE INFORM-A-GRAM KEY NO. 741

Industrial Material Storage Racks are featured in a new bulletin published by Chicago Tramrail Corp., 1330 S. Kostner Ave., Chicago. Ap-

plication drawings and photographs helpful in planning are included. Ask for Bulletin R-400 from the company, or Circle No. A8.

Tools, Equipment, and Facilities at the Textile Machine Works, Reading, Pa., plant used in the manufacture of a variety of high precision parts, assemblies, and complete machines, are presented in a bulletin. For your copy write the company, or Circle Inform-A-Gram No. A9.

Over Fifteen Production Patterns can be set on the Dial-Cycle selector on carriers to perform automatic operations on standard Abbey-Matic automation systems. By turning the dial, operations can be



set up and cycles can be altered at any point during processing by resetting or relocating electromagnetic trippers. Abbey Process Automation, Inc., 37-01 48th Ave., Long Island City 1, N.Y., or Circle Inform-A-Gram No. A10.

A Cleaning Equipment Bulletin gives information on the full range of hand portable models, industrial tank cleaners, commercial model cleaners, and optional attachments. Specifications on all equipment are listed. Get your bulletin from Ace-Sycamore, Inc., 448 Dekalb Ave., Sycamore, Ill., or Circle Inform-A-Gram No. A11.

DoALL ECONOMY SPECIAL

PRODUCTO-CHEK® Mechanical Comparator

More proof that DoALL gives you top quality at no extra cost—this fine mechanical comparator.

Provides a simple, inexpensive means of applying the comparator method to the mass checking of finished parts and the inspection of gages. Computation and interpolation unnecessary—scale shows desired measurement units. Self-compensating to temperature changes. Lead screw arrangement facilitates rapid positioning of gaging head.

In stock at your local store, the world's largest selection of measuring instruments and cutting tools.

Model 100M (Each division, inch, .0001; full scale, inch, .006)

only $242.25
This offer good through January 1959

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DoALL safeguards quality with double inspection. Your engineers spend time on their own work, not on trouble-shooting. — *Danny DoALL*

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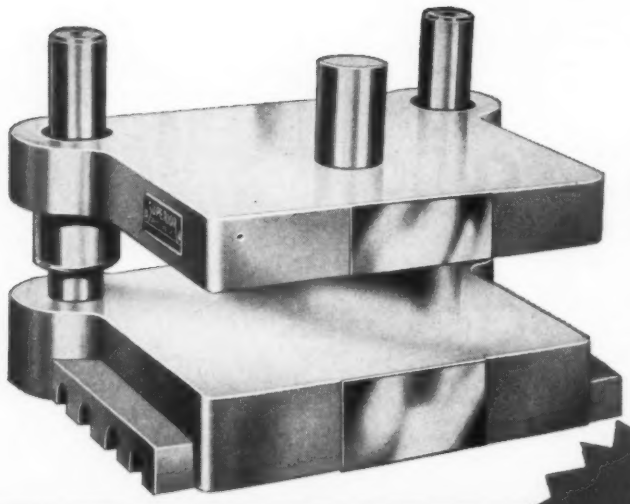


SUPERIOR DIE SET Exclusives

SAVE TIME AND CUT OVERALL DIE MAKING COSTS!!

No fumbling or wasted time with large or small die sets when you use Superior. Assembly and disassembly of these precision sets is rapid. In addition they provide safety insurance . . . protection for the skilled hands of die makers and handlers . . . protection also against the ruining of costly dies in handling, or even damaging valuable press equipment.

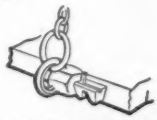
All Superior Die sets are jig bored to your specifications—result number of die set sizes practically limitless.

Add to this such outstanding features as *Precision Center Marks, Long and Short Bushings, Superfinish Pins* and you can see why Superior is your best die set buy.

Write today for 24 page catalog.

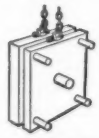
SAFETY FLANGE

protects fingers by providing roomy gripping space on either side of the die shoe.



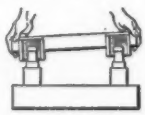
LOCK-JAW LIFTING DEVICE

removes the danger of handling large die sets.



E-Z LIFT SLING CHAIN

attach to the lock-jaw for immediate lifting.



"REMOVABLE CAP" PINS

End troublesome binding in parting dies.

For Fast Local Service Call These Expert Superior Representatives.

2 PLANTS TO SERVE YOU

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St. Louis, Mo. Jefferson 5-1223	Memphis, Tenn. Fairfax 3-7727	West Newton, Mass. Bigelow 4-2070
Indianapolis, Ind. Clifford 5-5668	Denver, Colo. Enterprise 234	Agawan, Mass. Republic 9-1132
Rockford, Illinois 3-3931	Winter Park, Fla. 4-0464	Brooklyn, N. Y. Esplanade 6-1368
Dayton, Ohio Hemlock 6209	Racine, Wis. Melrose 2-1900	Cheshire, Conn. Browning 2-4887
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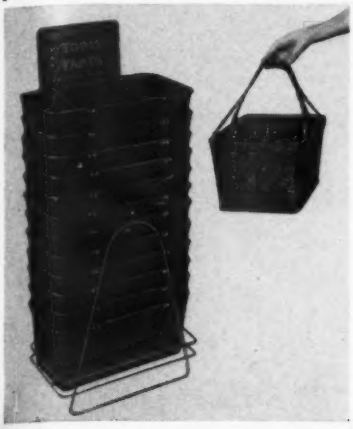
SUPERIOR STEEL PRODUCTS CORP. 2754 South 19th St. Milwaukee, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 761

These Light Weight Canvas Tote Baskets are durable and easy to handle. They can be used for transporting or storing small parts from



operation to operation, for assembly, inspection and repair, and they come in two sizes. Handy Folding Pail Co., Inc., 17 Thompson St., New York 13, or Circle Inform-A-Gram No. A12.

A New Phosphate Material for use as an anti-friction brake-in coating and as a foundation for oil and plant, is announced in a bulletin from Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1. Uses, specifications, and equipment for application of Turcoat 3557 are covered in a bulletin from the company, or Circle Inform-A-Gram No. A13.

"Unistrut Metal Framing System" is a booklet which shows how to build any type of all metal framed structure. It shows typical electrical and mechanical applications as well as uses of racks, shelving, and partitioning. Unistrut Products Co., 933 W. Washington Blvd., Chicago 7, supplies copies of the S-5 Folder, or Circle Inform-A-Gram No. A14.

Simplify Storage Problems by storing more in less space, eliminating extra handling, increasing stock storing efficiency, and improving inventory control using the Mini-Module stock storage racks described in a bulletin. Specifications and possible construction arrangements are included in Bulletin R-200-58 from Jarke Mfg. Co., 6333 W. Howard St., Chicago 31, or Circle Inform-A-Gram No. A15.

A General Engineering Parts Catalog gives complete information on Unistrut's all purpose bolted metal framing system. The 180-page catalog lists 1,400 fittings. Get your copy of Catalog 5 by writing Unistrut Products Co., 933 W. Washington Blvd., Chicago 7, or Circle Inform-A-Gram No. A16.

A New Bacterial Inhibitor for cutting fluids extends effective life of soluble oil emulsions, and eliminates odor and spoilage due to bacterial contamination. Read about other advantages of Elcide 75 in a bulletin from Eli Lilly and Co., Agricultural and Industrial Products Div'n, Indianapolis 6, or Circle Inform-A-Gram No. A17.

Data on Wire and Sprayed Powder Coatings of metals and ceramics is presented in an engineering bulletin that covers their basic characteristics and mechanical and electrical-electronic applications. Bulletin 136A can be obtained from Metallizing Engineering Co., Inc., 1101 Prospect Ave., E. Westbury, L. I., N.Y., or Circle No. A18.

"Small Parts for Industry," a revised bulletin, covers a variety of zinc alloy die cast and molded thermoplastic products in chart form. Both parts made to customers' specifications and stock items are described. Get your copy from Gries Reproducer Corp., 400 Beechwood Ave., New Rochelle, N.Y., or A19.

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PRODUCTS & PROCESSES & PRODUCTS

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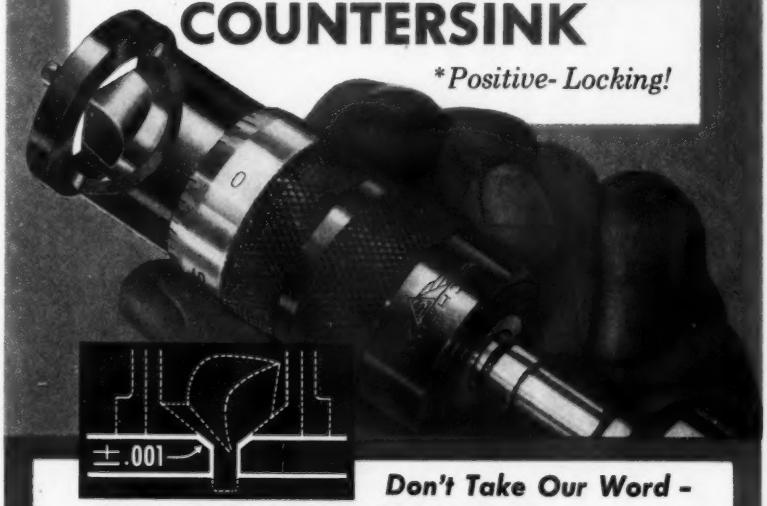
ADJUSTABLE MICRO-STOP *

COUNTERSINK

*Positive-Locking!



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YOU BE THE JUDGE!

Never will you find so much value at so low a price! Highest quality steel and superb workmanship. Precisely engineered to provide instant finger-tip adjustment to .001" without the use of wrenches or tools. Self-lubricating oversize bearings. Ball-thrust friction-resistant operation guarantees longer trouble-free wear.

The Positive-Locking Micro-Adjustment assures controlled accuracy to a tolerance of ±.001" — to prevent costly production losses by over or under cutting. Glass-smooth shield will not scratch or mar work piece. May also be used interchangeably for precision trepanning or removing collars from Hi-shear rivets.

TWO SIZES: 4" for cutters up to 5/8" dia; 5½" takes cutters to 1½" dia.
For complete information about superb Schrillo Tools — write or phone for the all-new catalog No.104D

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8715 MELROSE AVE., LOS ANGELES 46, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 771

when will this cutter need GRINDING?

When the blades get dull, of course.

But when is a cutter blade dull? At what degree of dullness does it begin to consume increasingly more horsepower and produce inferior finish? At what point does grinding prolong blade life?

Knowing *exactly* when to grind cutters is just one of the many variables that vitally affect performance and costs.

Our specialty is working with these variables—to furnish the most economical solutions to milling and boring problems, including grinding techniques, through the use of inserted blade cutters.

We study machine, work piece, feed rate, depth of cut, speed and finish requirements. And only after pooling this information with the customer's specialized knowledge of his own work is any cutter recommended.

We would appreciate the opportunity to tell you more about this unique cutter selection service. Write:

CIRCLE INFORM-A-GRAM KEY NO. 781

This helpful new booklet tells you how to reduce the cost of chips and improve your milling and boring performance. Ask for a free copy of booklet No.68.

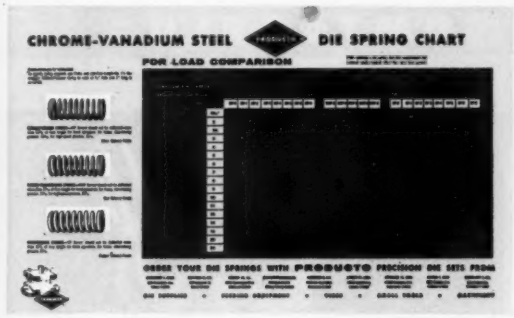
THE
INGERSOLL
MILLING MACHINE COMPANY
CUTTER DIVISION
505 FULTON AVENUE • ROCKFORD, ILLINOIS

DIE SET DATA

available from PRODUCTO

Die Set Catalog No. 11

This easy-to-use general catalog contains compact, complete listings and illustrations of Producto's broad line of die sets and die makers' accessories. There's a separate price book with *net* prices. A unique new binding enables you to have the technical data and price information side-by-side—no flipping back and forth required. *Color* spotlights key information and speeds up your use of the catalog. Many important new accessory items are included. Free.*

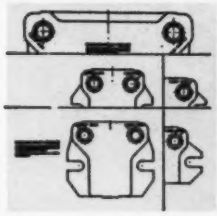


Die Spring Comparison Chart

Die spring selection is simplified by this 12″ x 20″ chart in two colors, suitable for wall mounting. Convenient for use at the drawing board, bench or in the stockroom. Covers all three series of Producto chrome-vanadium die springs: Medium-pressure 50% deflection, Medium high-pressure 37% deflection, and High-pressure 30% deflection. Free.*

Die Set Digest

Every issue of this 8-page quarterly publication is packed with valuable hints for designers, manufacturers and users of dies. Hard-to-find information is presented clearly in the *Digest:* "Die Set Maintenance in the Pressroom"; "How to Select and Use Die Springs"; "How to Lubricate for Longer Life". Write and ask to receive *Die Set Digest* regularly. No charge.*

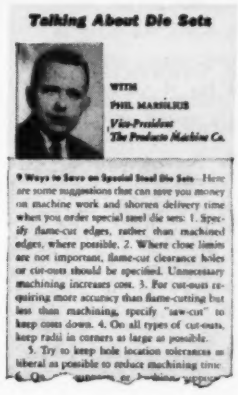


Die Set Templates

Accurate full-size templates for Producto rear-pin die sets. Save time and simplify layout for the busy die designer. $3.50 set. Write today.

Die Set Specification Stamp

Rubber stamp for tracings, prints. Provides spaces for die set ordering information. Free.*



Ad Reprints

Valuable die set know-how is provided in recent "Talking About Die Sets" columns: *How to Save on Steel Specials, Steel vs. Semi-steel,* and others. Send for complete file, free.*

*WRITE TODAY for these useful and informative diemaking aids. Requests on company letterheads will be filled promptly.

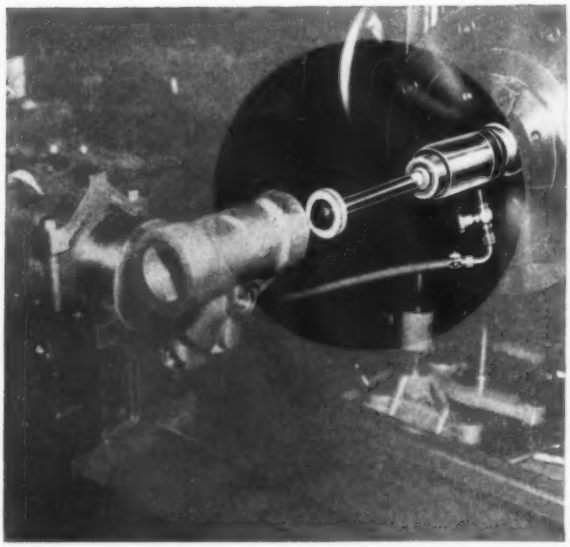
THE PRODUCTO MACHINE COMPANY
970 Housatonic Avenue, Bridgeport 1, Connecticut

Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

HOLES JIG GROUND with *Vulcanaire*



SPECIAL VULCANAIRE ON A BORING MILL

Micro-finish and accuracy required on this large part. Vulcanaire 20,000 Series, with special grinding spindle, ground the hole to specifications. By controlling speed at ANY point you eliminate need for a variety of types and kinds of constant speed spindles.

Provide yourself with this inexpensive instrument for use on your present equipment and JIG GRIND with a guarantee.

{ Borrow our instructive 11 minute movie on Jig Grinding. }

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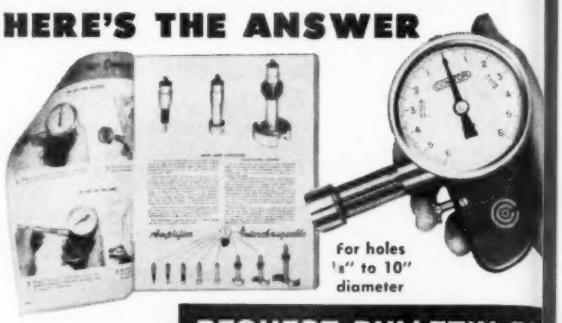
741 Lorain Ave., Dayton 10, Ohio

VULCAN tools

CIRCLE INFORM-A-GRAM KEY NO. 801

For gaging close-tolerance holes

HERE'S THE ANSWER



REQUEST BULLETIN 50

Here's the required **PRECISION** for hole tolerances within .0001" plus **TREMENDOUS ECONOMY**

A very modest cost puts it to work . . . no training program, no wire, no air hose or electronics. Unique interchangeable expanding plugs give positive 2-point gaging. Detects tapers, bell mouth, ovality. Shows ACTUAL HOLE SIZE. Fixed — not passing — reading. Special plugs available to gage shoulders, splines, recesses, spherical holes, etc. Ideal for use AT MACHINE, as well as bench.

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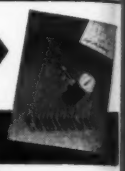
SEND FOR BULLETIN 50 →
Comtor Co., 82 Farwell St., Waltham 54, Mass.



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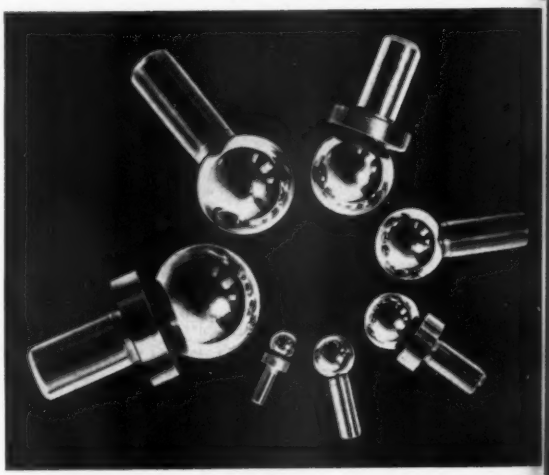

TOOLING BALLS

- **Durable, hardened stainless steel.**
- **Highly accurate.**
- **Three types; 7 standard sizes.**

WRITE FOR price list and ASTE Data Sheet.

INDUSTRIAL TECTONICS, Inc.

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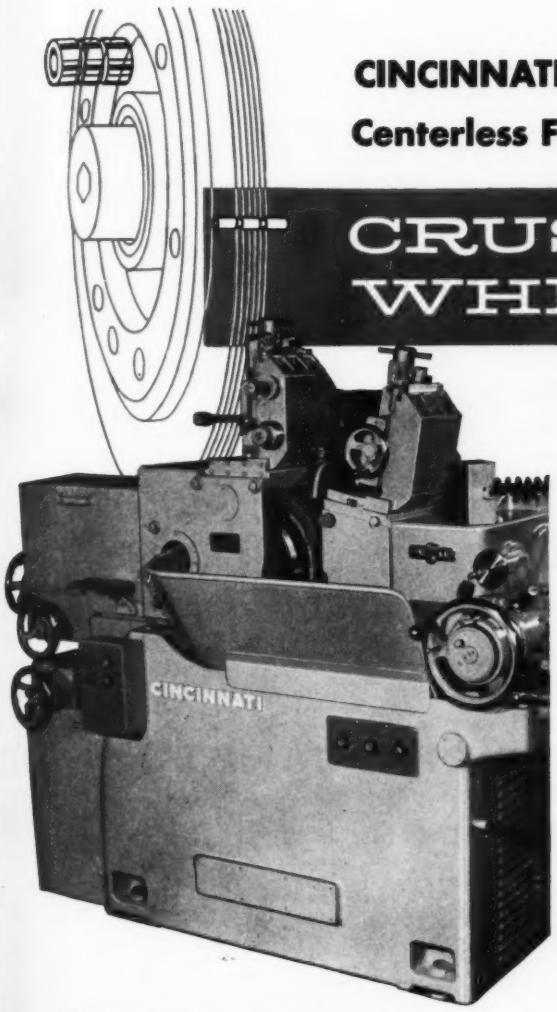
MANUFACTURERS OF PRECISION BALLS AND BEARINGS
3693 JACKSON ROAD
ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 803

CINCINNATI gives you a New Concept in Centerless Form Grinding with

CRUSH TRUED WHEELS



CINCINNATI FILMATIC No. 1 Centerless Grinding Machine, with Crush Truing Attachment *(left)* and Electro-Hydraulic Automatic Infeed Attachment. Catalog No. G-703-1.

New methods are always enhanced by the latest design equipment. Take centerless form grinding with crush trued wheels, for example. Cincinnati has developed a new, highly proficient Crush Truing unit for CINCINNATI FILMATIC Nos. 1 and 2 Centerless Grinding Machines. It incorporates several new ideas in wheel crushing which contribute to the end result of precision form grinding at the lowest possible cost.

Minimum setup time. Crushing rolls are cartridge mounted and easily interchanged. Lateral adjustment provided for positioning.

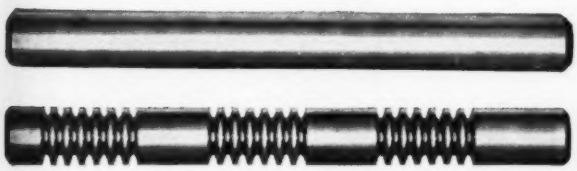
Dial indicator provides visible check on crushing feed rate. Handwheel for rapid positioning.

Long crushing roll life. Rolls are 5½" diameter for No. 1 Centerless and 6" diameter for No. 2 Centerless. Separate motor drive to re-grind worn rolls in position.

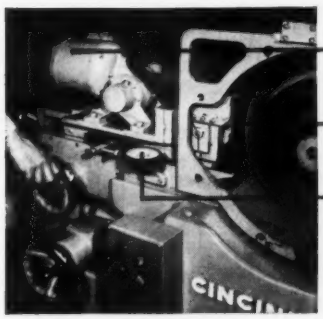
Correct grinding wheel speed for crushing, through an auxiliary motor drive and overriding clutch.

Low-cost crush form grinding on a CINCINNATI Centerless is augmented by many Cincinnati exclusives such as FILMATIC grinding wheel spindle bearings and the world's most experienced Centerless Grinding Engineering service. Look into this method of precision grinding as a new production idea. You can start by writing for Cincinnati Crush Truing brochure No. G-706.

GRINDING MACHINE DIVISION
The Cincinnati Milling Machine Co.
Cincinnati 9, Ohio



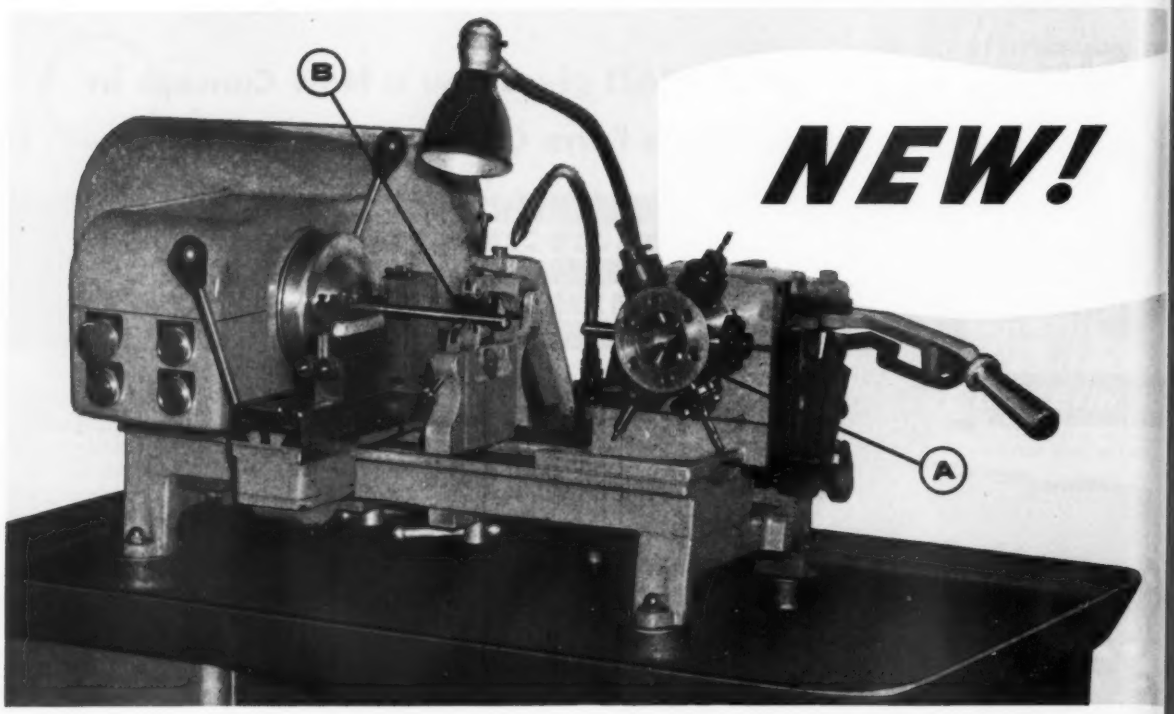
Rack teeth crush form ground from the solid in one operation on a CINCINNATI FILMATIC No. 2 Centerless. Major diameter .500", minor diameter .320" (.090" depth of cut). Before and after grinding illustrated.



CINCINNATI®

CENTERTYPE GRINDING MACHINES · CENTERLESS GRINDING MACHINES
MICRO-CENTRIC GRINDING MACHINES · CHUCKING GRINDERS
ROLL GRINDING MACHINES · CENTERLESS LAPPING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 811



NEW!

CHALLENGE .625" PRECISION TURRET LATHE

for faster handling of secondary operations or short runs on small precision parts

Look at these important new operating features:

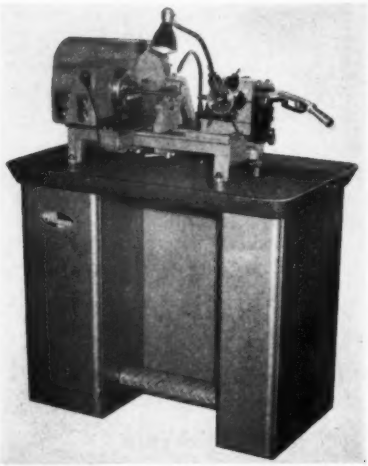
(A) AUTO-INDEX TURRET

Vertical turret automatically returns to starting position when operating lever is lowered, eliminating need for operator to index through all positions to return to starting position. Number of work stations desired can be preset.

(B) AUTOMATIC STEADY REST

Steady Rest automatically opens when turret indexes back to starting position, speeds removal of work pieces.

You'll want to know all about these and many other cost cutting features of the Challenge 625 . . . push button control, easy collet operation, two-post cross slide.



Rigid steel stand is integral part of machine, houses coolant tank and pump. Entire machine is 42" long, 25" wide, 51" high, occupies minimum floor space.

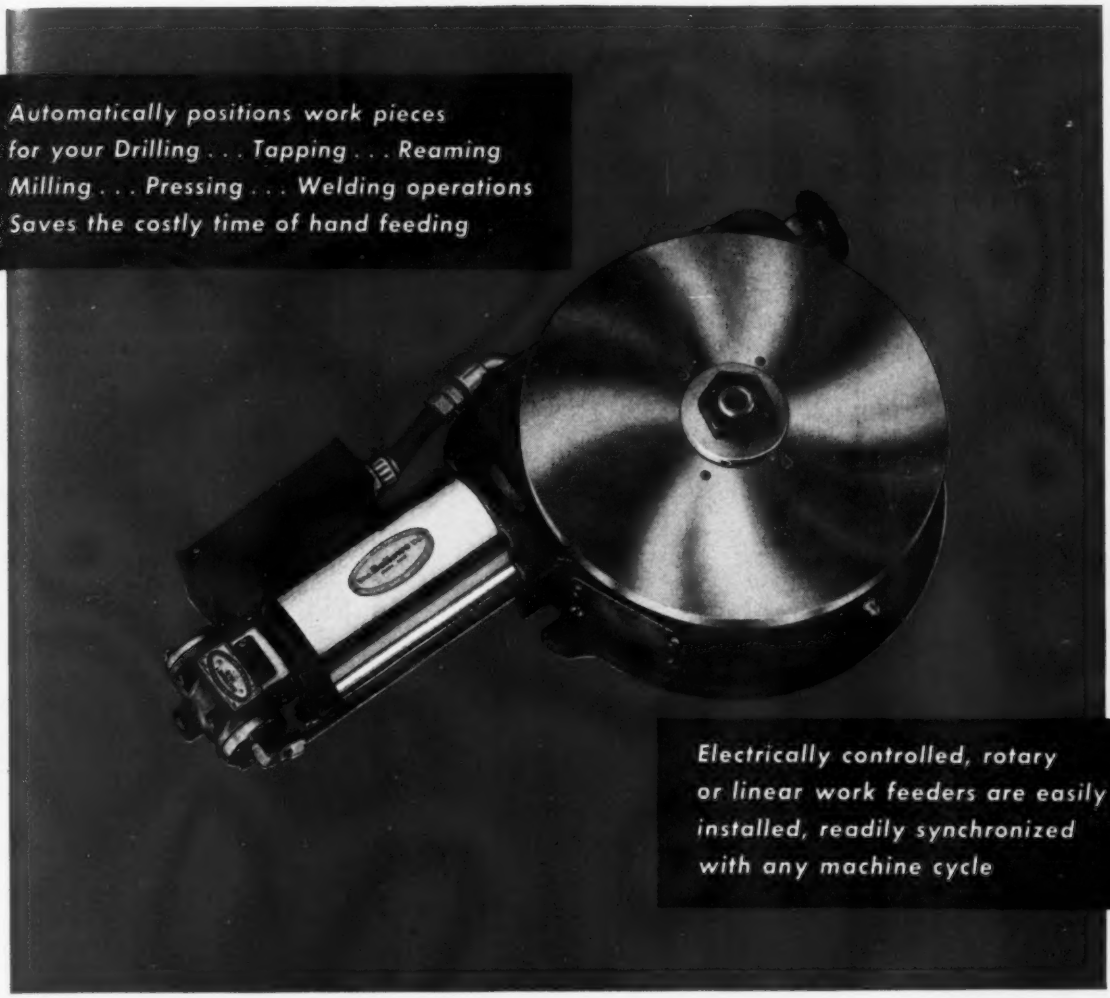
TL-101

Available through selected machine tool dealers.
For complete information, write today.

Challenge

THE CHALLENGE MACHINERY COMPANY
105 North First Street
GRAND HAVEN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 821


Automatically positions work pieces
for your Drilling . . . Tapping . . . Reaming
Milling . . . Pressing . . . Welding operations
Saves the costly time of hand feeding
Electrically controlled, rotary
or linear work feeders are easily
installed, readily synchronized
with any machine cycle

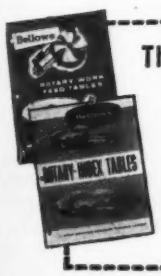
QUALITY CONTROL CAN BEGIN AT THE POINT-OF-OPERATION WHEN YOU FEED PARTS WITH BELLOWS WORK FEEDERS

You will have many more acceptable parts at Final Inspection if you examine work pieces at the point-of-operation. To give machine operators time for visual inspection, feed parts to tools with Bellows Work Feeders. The operator will then have time to load at one station, unload and examine a finished part while his machine continues to work. Not only will there be time for examination of the machined part but you will be able to use more of the machine's producing ability. The tool won't be standing idle while the operator loads and unloads.

Bellows Work Feeders are made in both rotary and linear type models; different units designed for high speed parts positioning where tolerances are not critical, or precision indexing types where close accuracy is required.

Air-Powered, electrically controlled, they are easily installed on standard machine tools, can be readily synchronized to work with the basic machine cycle.

To cut machining costs . . . keep the machine working while you load or unload a fixture.



These Bulletins give you the Facts

Write for Bulletins RT 1022 and RT 1326 for full specifications and application data on Bellows Work Feeders. Address Dept. TP159, The Bellows Co., Akron 9, Ohio. In Canada, Bellows Pneumatic Devices of Canada Ltd., Toronto 18, Ontario.

The Bellows Co.

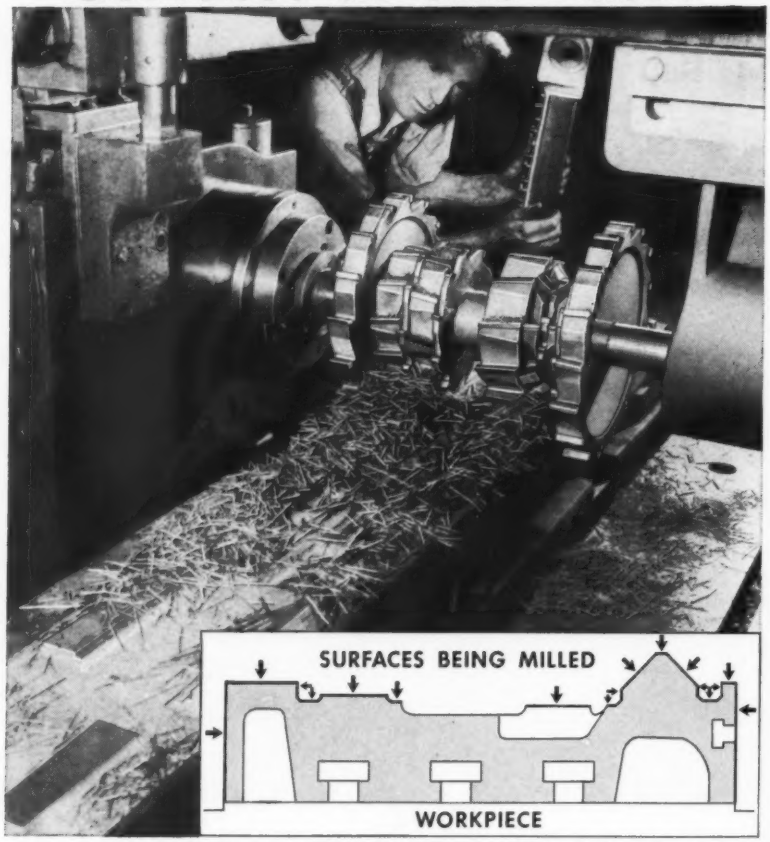
DIVISION INTERNATIONAL BASIC ECONOMY CORPORATION

AKRON 9, OHIO

1030-B

CIRCLE INFORM-A-GRAM KEY NO. 831

12 Ganged Cutters Mill 17 Grinder Table Surfaces at One Pass!



Does in minutes what a planer used to do in a day—1 pass against multiple passes, 1 set up against multiple set ups.

Brown & Sharpe Cutter Engineering, sufficient machine tool power and 12 dependable Nelco Carbide Tipped Cutters on a single arbor, combine to perform 17 precise climb milling cuts at one pass.

Result: Close relative tolerances on all machined surfaces, a finer end product and . . . substantially less production time and cost.

Moral: On jobs that require rugged cutting tool dependability, specify B & S – NELCO. Brown & Sharpe Cutting Tool Engineers are available to help you save production dollars, improve product quality – whenever, wherever you need them.

Send for Brown & Sharpe High Speed Steel and Nelco Carbide Tool Catalogs Today. Write: Cutting Tool Division, Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Brown & Sharpe

CUTTING TOOL DIVISION

HIGH SPEED STEEL CUTTERS
NELCO CARBIDE TOOLS
END MILLS

PROGRESS IN PRECISION FOR OVER 125 YEARS
FOR THAT EXTRA EDGE IN PRODUCTION

CIRCLE INFORM-A-GRAM KEY NO. 841

Brown & Sharpe's cutting tool engineering service expanded with the appointment of **Ralph C. Anderson,** representing the Milwaukee area and working out of the Chicago office, and **William H. Yates,** serving the lower Connecticut and Long Island area.

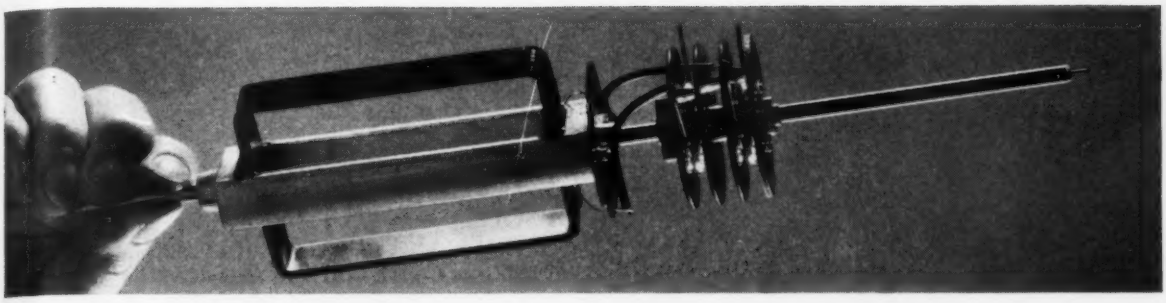
Taking over as vice president in charge of sales for The Dumore Co. is **Tom Carroll.** Replacing Carroll as sales manager is **Harry Wardrip,** former assistant sales manager.

New sales representatives for American Coldset Corp. include **C. R. Gilmore,** northern Ohio; **E. B. Narber,** Florida; **G. R. Davenport,** southeastern New York State; **W. E. Miller,** eastern Pennsylvania and southern New Jersey; **Eugene L. Brown,** Alabama; and **M. E. Clark,** northern Connecticut, Massachusetts, Maine, New Hampshire, and Vermont.

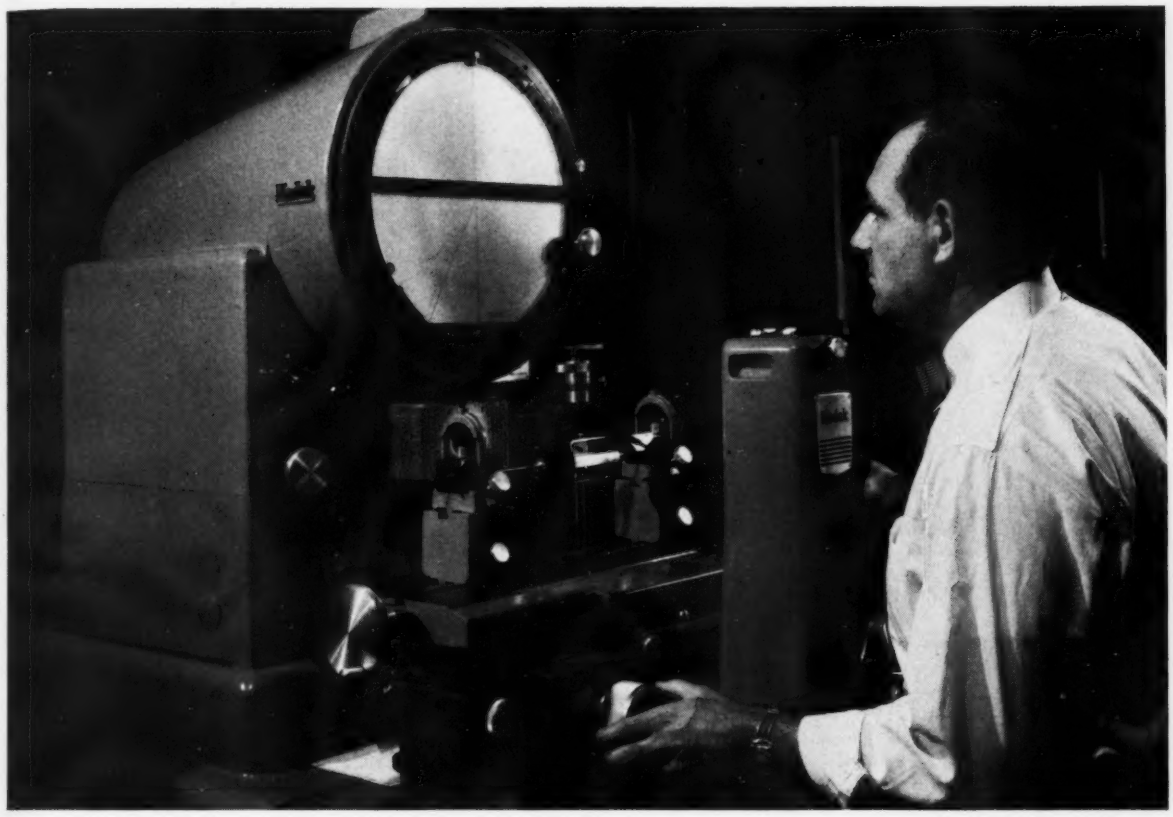
Organizational changes announced by the Bellows Co., Division of International Basic Economy Corp., are **W. C. Butcher,** vice president-general manager of The Bellows Co. of Calif.; **L. A. Boese,** sales manager, also in California; **Frank V. Stauffer,** Cleveland district manager; and **F. L. Walters,** Detroit district manager. Other appointments are: **J. C. McComb,** assistant chief engineer of Hydrair Corp.; **L. E. Neafie, Jr.,** Dayton territory; **Will Robb,** Cincinnati field engineer; **Lowell E. Adair** and **Dan Ostroga,** Los Angeles; and **Duane E. Hargreaves** and **George C. Anderson,** Chicago.

Torco-Pac press sales manager for Clearing Machine Corp., Division of U. S. Industries, Inc., is **David W. Bonnar.** The company also has named **George E. Wind** assistant service manager.

The advancement of **Don Johnson** from Detroit branch manager to sales manager was announced recently by ALMCO, Queen Products Division. Other promotions include **Al Sartor,** Detroit branch manager; **Bruce Hardin,** Michigan sales engineer; and **George Shelson,** sales coordinator.



Before Westinghouse said "You can be SURE"...



they checked concentricity with this Kodak Contour Projector

What you see above is the moving element used in Westinghouse Type 44 electrical recording instruments.

Exact clearance between this element and the stationary elements is essential since these instruments often must be used in extreme temperature zones. This, along with the accumulation of tolerances in the complete assembly means that control of *concentricity* is vital.

You *could* check using surface plate, V-blocks, and height gage with clock indicator.

But Westinghouse checked concentricity with a Kodak Contour Projector. They saved time. They saved the cost of gages. They had *no* worries about damaging delicate parts because a beam of light exerts no pressure. And engineers were able to make corrections *before* production was started.

You, too, can be sure about effective, economical inspection with a Kodak Contour Projector.

The Model 14-5, shown in use at Westinghouse, is one of 6 models. They range from a portable, bench type model with 8-inch screen to the big 30-inch screen model.

Get all the facts. Write to:

Special Products Sales

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

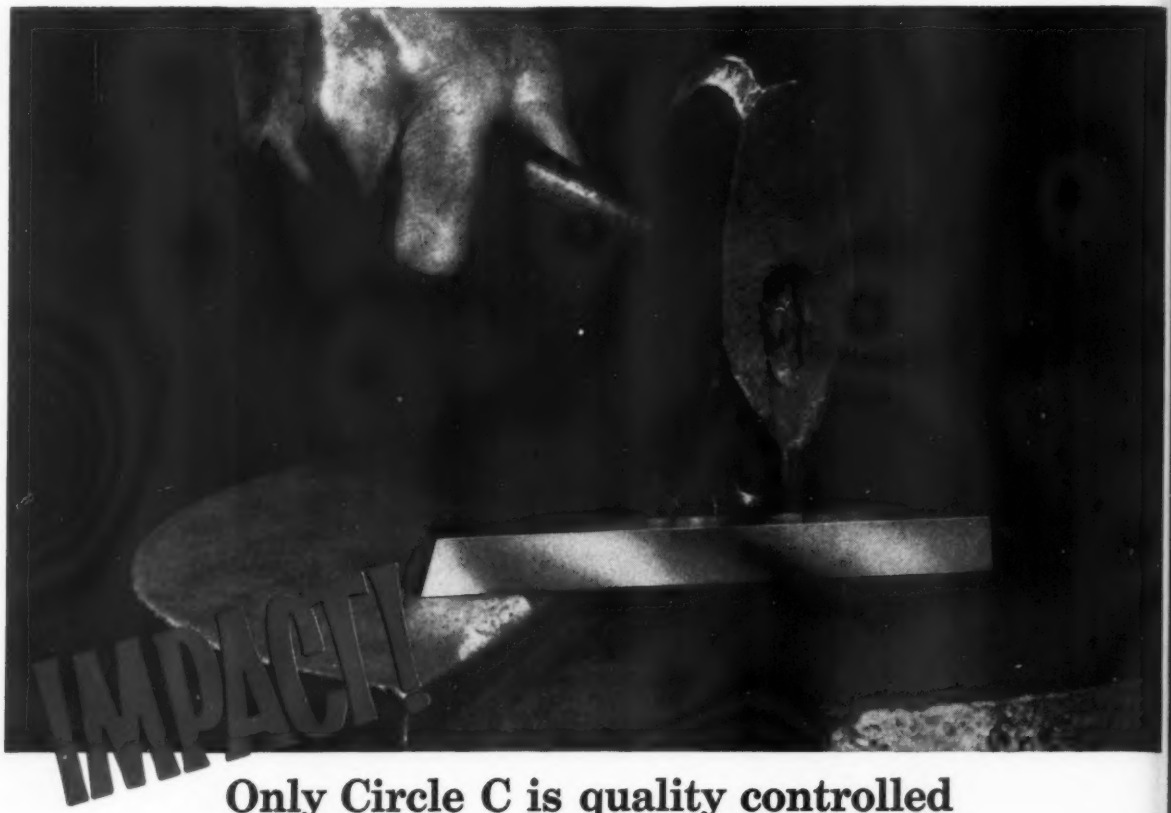
the KODAK CONTOUR PROJECTOR

Kodak

CIRCLE INFORM-A-GRAM KEY NO. 851

Firth Sterling ...

PIONEER IN POWDER AND MOLTEN METALLURGY



Only Circle C is quality controlled by impact testing

Every Circle C High Speed tool bit is tested under impact to make sure you get the best bit that can be made. This is the final test in a series of quality control checks made during each stage of production, from Firth Sterling's exclusive double melting process to the finished bit.

Being double melted, Circle C has greater homogeneity that assures toughness and consistent performance, delivers cutting capacity far beyond that of ordinary high speed steels. With Circle C bits you can use higher operating speeds, obtain longer tool life and increase your production. And the practical, well balanced composition gives Circle C unusual red-hardness and wear resistance, provides ONE grade for almost all your machining operations.

Circle C is one of a family of outstanding high speed steels, including Van Chip, Blue Chip and Star-Mo, accepted throughout industry for reducing machining costs today. All are evidence of Firth Sterling's metallurgical leadership—a background of over 68 years of research and development.

* * *

*For assistance with your metallurgical problems, powder or molten, simply call your nearest Firth Sterling sales office or distributor. For complete information on High Speed tool bits—**and the new Circle C throw away inserts**—write for descriptive bulletin TBI-57:* FIRTH STERLING, INC., Dept. 11A, 3113 Forbes St., Pittsburgh 30, Pa. Offices and warehouses in principal cities.

"Your Future is Great in a Growing America"

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HIGH SPEED STEELS • TOOL & DIE STEELS • STAINLESS SPECIALTIES • HIGH TEMPERATURE ALLOYS
SINTERED TUNGSTEN CARBIDES • HEAVY METAL • CERMETS • CHROMIUM CARBIDES
ZIRCONIUM • STERVAC & STERCON SUPER ALLOYS

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13	32	651	821	932	984	1065	1133	1211	1334
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16	34	671	841	934	1001	1071	1142	1231	1341
17	35	681	851	941	1002	1072	1151	1241	1351
18	36	691	861	942	1003	1081	1152	1251	1361
19	38	701	871	943	1011	1082	1153	1261	
20	61	711	881	951	1012	1083	1161	1271	
21	62	721	891	952	1021	1091	1162	1281	
22	63	731	892	953	1031	1092	1163	1291	

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A1	A19	D2	F8	G10	H10	J12
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A3	B2	D4	F10	G12	H12	J14
A4	B3	D5	F11	G13	H13	J15
A5	B4	D6	F12	G14	H14	J16
A6	B5	D7	F13	G15	H15	J17
A7	B6	E1	F14	G16	H16	J18
A8	B7	E2	F15	G17	J1	J19
A9	B8	E3	F16	G18	J2	J20
A10	B9	E4	G1	H1	J3	J21
A11	C1	E5	G2	H2	J4	J22
A12	C2	F1	G3	H3	J5	J23
A13	C3	F2	G4	H4	J6	J24
A14	C4	F3	G5	H5	J7	J25
A15	C5	F4	G6	H6	J8	J26
A16	C6	F5	G7	H7	J9	J27
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THESE INFORM-A-GRAM CARDS are for the convenience of *TOOLING & PRODUCTION* readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

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A11	C1	E5	G2	H2	J4	J22
A12	C2	F1	G3	H3	J5	J23
A13	C3	F2	G4	H4	J6	J24
A14	C4	F3	G5	H5	J7	J25
A15	C5	F4	G6	H6	J8	J26
A16	C6	F5	G7	H7	J9	J27
A17	C7	F6	G8	H8	J10	J28
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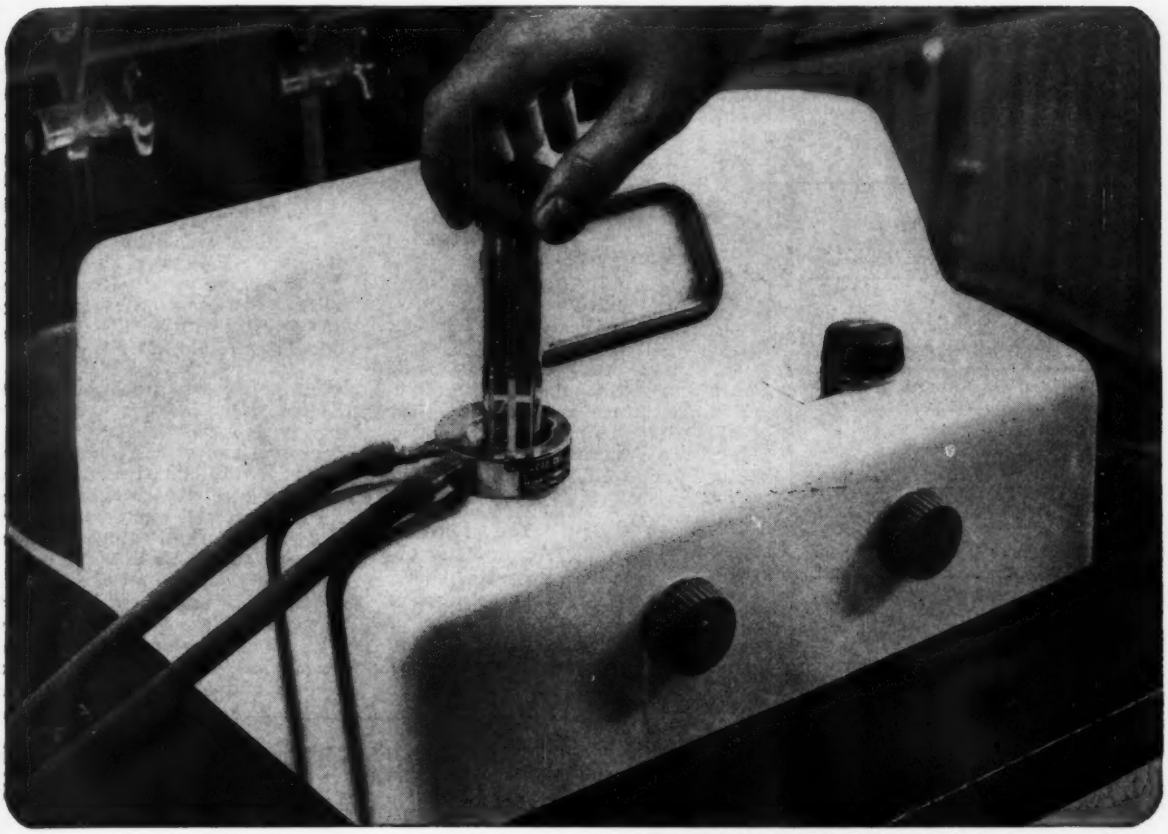
***Experience**—the added alloy in **Allegheny Ludlum** tool steels*



COLORIMETER (inherently extremely accurate) determines percentages of molybdenum, tungsten, cobalt and manganese in A-L tool steel to insure consistent, high quality.

Colorimeter measures exact chemical composition of Allegheny Ludlum tool steel melts

Accurate adjustment of alloys guarantees uniform heat treatment, predictable dimensional changes, reduced grinding, standardized machining operations.

Close control of molybdenum, tungsten, cobalt and manganese is at the heart of a good tool steel melt. In addition to the usual testing methods, Allegheny Ludlum's chemical laboratory checks these metals with Colorimetry because of its inherent, extreme accuracy.

On the basis of the Colorimeter's findings, it is possible to make carefully calculated furnace additions of ferro-alloys, insuring precise control over chemistry. This guarantees your receiving the *exact* analysis order after order, providing *uniformity of heat treatment, predictable dimensional changes, reduced grinding and standardized machining operations.*

Colorimetry is but one step toward careful control over composition. Allegheny Ludlum also sets exacting purchasing specifications on raw materials and scrap. Quality Control checks all incoming orders to see that they conform with these specifications. Another guard toward your getting your exact specifications: each ingot bears a metal tab showing heat number.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

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NOBLE & STANTON, INC.
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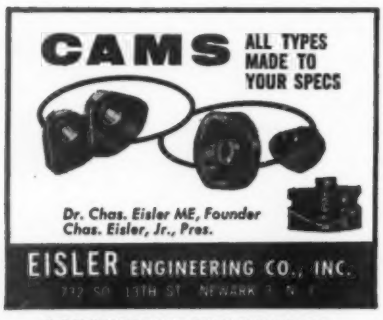

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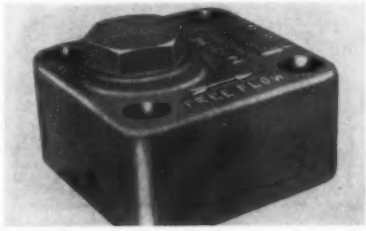
Pneumatic & Hydraulics

PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

These Check Valves are used for rugged, dependable operation in hydraulic systems up to 5,000 psi to block oil flow in one direction, yet allow free flow of oil in the reverse

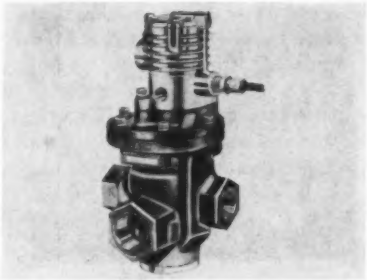


direction. Both subplate and sandwich types are available in either ¾" or 1¼" sizes. Denison Engineering Div'n, American Brake Shoe Co., 1160 Dublin Rd., Columbus, Ohio, or Circle Inform-A-Gram No. B1.

The SpeeCo Accumulator absorbs line shock, reduces pressure peaks, and smooths out pump pulsations. It also acts as an effective booster in storing hydraulic energy. It's easy to install and maintain, and comes in 13 sizes, from 15 to 7500 cu in, for units up to 2,000 psi. Special Products Co., Golden, Colo., or Circle Inform-A-Gram No. B2.

A Pneumatic Drills Bulletin presents information on several models of tools and different applications, and also discusses the pneumatic saw and file and lubricator. Specifications for these items are given in the bulletin, available from Air Speed Tool Co., 1502 W. Slauson Ave., Los Angeles 47, or Circle Inform-A-Gram No. B3.

Fast Response is possible with the new Valvair in-line poppet-type pilot-operated control valve. It's intended for brake, clutch, and other high speed operations where main operating pressure is below 20 psi



or where pressure on the valve is reduced below 20 psi for machine setup. Get information from Valvair Corp., 454 Morgan Ave., Akron 11, Ohio, or Circle No. B4.

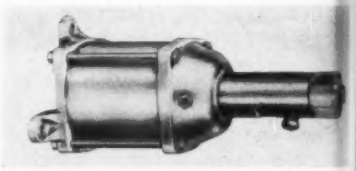
For Easy Mounting on machines when space is limited, use the Quick-As-Wink ball-actuated spring-return valve which is only 1" thick and 3" wide. They are for air, oil, or water service, pressures to 125 psi, and temperatures to 150°F. Hunt Valve Co., Salem, Ohio, or — Circle No. B5.

An Automatic Compressor Control System, Tendamatic, continuously supervises and checks compressor operation and warns if malfunction occurs. A bulletin gives models, capacity control features, and advantages. Ingersoll-Rand, 11 Broadway, New York 4, supplies Bulletin 3259, or Circle No. B6.

Silence Noises caused by exhausting air with the Mead midget mufflers. They're compact, durable, and economical, and come in several models and sizes. For information,

write Mead Specialties Co., Dept. MM-93, 4114 N. Knox Ave., Chicago 41, Ill., or Circle Inform-A-Gram No. B7.

This Air-Hydraulic Booster mounts vertically to prevent the dead weight of internal parts from causing distortion in the hydraulic seal. Another feature is the new air filter



made of solid bronze particles pressed together to form a fine mesh to catch dirt and grit. Wilton Tool Mfg. Co., Inc., Schiller Park, Ill., or Circle Inform-A-Gram No. B8.

Important Factors in the selection of power cylinders for specific applications are listed in a bulletin from Miller Fluid Power Div'n, Flick-Reedy Corp., 2040 N. Hawthorne Ave., Melrose Park, Ill. Suggestions include operating conditions and cylinder design and material consideration. Write to the company for your copy, or Circle Inform-A-Gram No. B9.

The new Grind-A-Matic is an air turbine grinding head which can be mounted either vertically or horizontally on almost any machine tool.

Its versatile application and high precision performance allow Grind-A-Matic to perform grinding operations normally done on an expensive jig grinder. Mounted the same as any standard tool, it becomes a close tolerance grinder for such work as internal grinding of tools, dies and fixtures.

Threadwell

GRIND-A-MATIC

provides jig grinder performance at drill press prices

- *Fine radial adjustment from "0" to .070" while the spindle is rotating.*
- *Uninterrupted precision grinding*
- *Coarse adjustment from "0" through 1¼"*
- *Spindle speeds from 50 to 75,000 RPM*
- *Standard range from ⅛" to 2½" holes*
- *Adapted to include holes up to 5½"*
- *Sealed air turbine and spindle bearings*

Threadwell **THREADWELL TAP & DIE CO.**
Greenfield, Mass.

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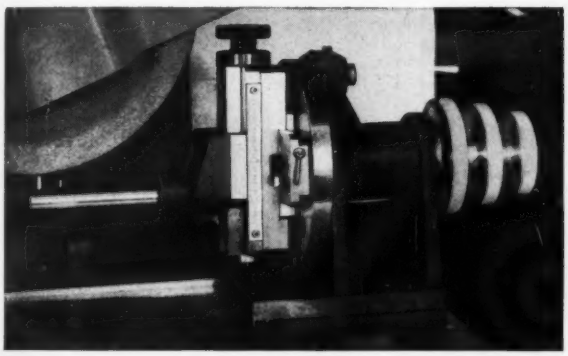

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Threadwell **THREADWELL TAP & DIE CO.**
Greenfield, Mass.

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are saving money with
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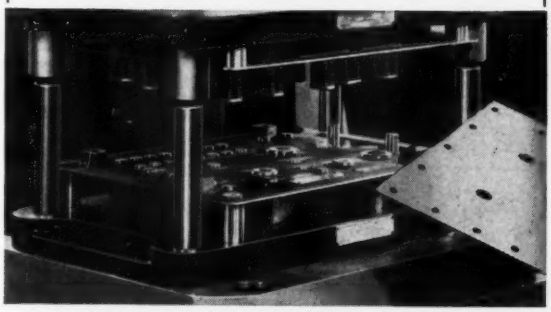

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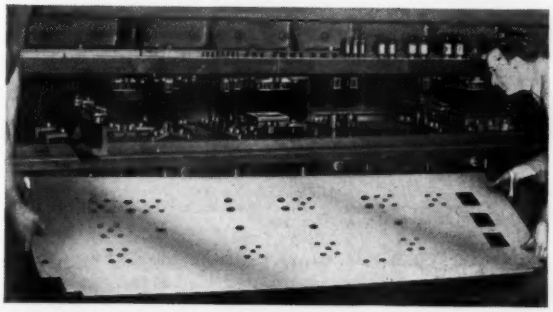
All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.



ADJUSTABLE PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.

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748 Military Rd., Buffalo 23, N. Y.

Mail the following: ☐ Magna-Die Catalog ☐ Adjustable Die Catalog
☐ More information on custom die work

NAME _____ TITLE _____

COMPANY _____

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CITY _____ ZONE _____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 893

A SIMPLE FORMULA TO CUT TOOLING COSTS UP TO 75%

No need to start from scratch . . . use the HEINRICH Grip-Master Jig and Fixture base . . .

A + B

Simply add false jaws and bushing plate.

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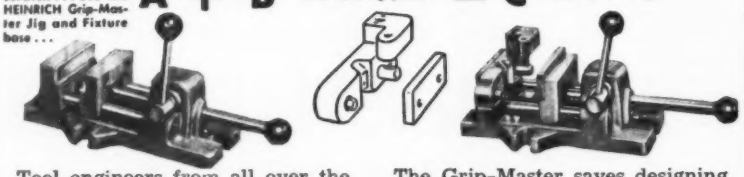
Result . . . an accurate, low-cost Drill Jig.



Tool engineers from all over the country continually report savings to 75% with Heinrich's simple tooling formula.

The Grip-Master saves designing time, tooling time, costly tool steel and speeds production.

Write for complete 28 page catalog.

HEINRICH TOOLS, Inc., Dept. 139-A, Racine, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 901

REID TOOL ROOM *Accessories*

CAST IRON HAND WHEELS

Solid Web and Counter Balanced. Made of fine grain cast iron. Center hole and faces of hub are true to rim. Rims and handles are ground and polished to high lustre. Adds distinction to product. Top quality. Low prices. Many sizes. Immediate delivery. Alterations when required at nominal prices.

MALLEABLE MACHINE HANDLES

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In Straight, Crank and Offset types. Many sizes. Will withstand severe usage. Neat. Ready for use.

COUNTER BALANCED

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Including plastic and steel ball handles. C. I. Hand Knobs, Compression Springs, Balanced Cranks. Clamping Levers, etc.

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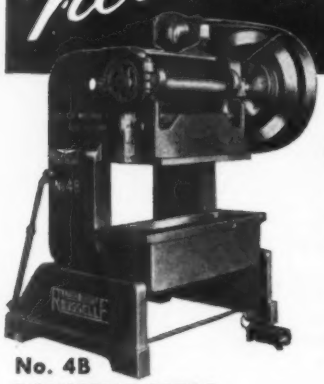

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- "Plug-in" foot and hand controls.
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- Low air consumption.
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CHOICE OF 30 SIZES AND TYPES IN 5 TO 40-TON PRESSES

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ROUSSELLE PRESSES ARE SOLD EXCLUSIVELY THROUGH LEADING MACHINERY DEALERS

CIRCLE INFORM-A-GRAM KEY NO. 903

Toolroom

PRODUCTS & PROCESSES & PRODUCTS

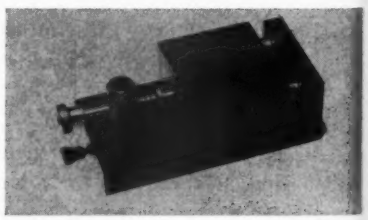
This New Two-Station Positive-Rake Fly Cutter was designed for skin and spar milling applications, particularly for aluminum forgings and castings. Tool life is increased because the solid carbide indexable blades remove the problem of brazing strains and permit cuts to a 90° shoulder. Get details from Futurmill, Inc., 6360 Highland Rd., Pontiac, Mich., or Circle Inform-A-Gram No. C1.

"Basic Fixtures—Full Size Tracing Templets" is a 27-page jumbo catalog which contains tracing templets for mill fixture bases and gang mill fixture bases, "T" angle plates, aluminum and cast iron tumble box jigs, and heavy-duty box jigs. Get your copy from Standard Parts Co., 1100 Broadway, Bedford, Ohio, or Circle Inform-A-Gram No. C2.

For Long, Accurate Measurements up to 40', use the Matrix stick micrometer sets that contain a micrometer head that reads in 0.001" increments, 1" spherical end pieces,

and additional pieces from 1" to 24". Sets range from 3" to 2' and from 6" to 40' size. Engis Equipment Co., 431 S. Dearborn St., Chicago 5, or Circle Inform-A-Gram No. C3.

Stainless Steel Hardened and heat-treated tool clamps come in sliding swivel, flat sliding, and swinging taper nose styles and have been de-



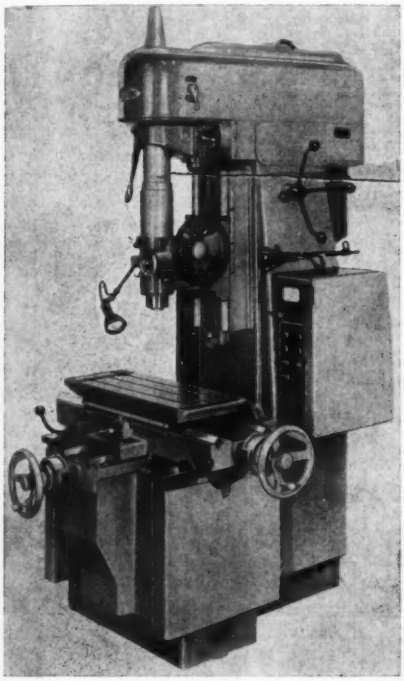
signed for a variety of fixtures. Get a tool component catalog from PIC Design Corp., Sub. of Benrus Watch Co., Inc., 477 Atlantic Ave., E. Rockaway, L.I., N.Y., or Circle Inform-A-Gram No. C4.

Toolroom
PRODUCTS & PROCESSES & PRODUCTS

TOOL STEEL CHART

A new chart lists the comparable brand names of 13 major tool steel suppliers. It classifies, by general type and SAE number, 16 different grades of tool steel. For your reference of tool steels, write Uddeholm Company of America, 155 E. 44th St., New York 17, or Circle Inform-A-Gram No. C5.

Finer Than Tenths Hole Location Accuracy is now possible with Model 3 precision jig borer introduced by Moore Special Tool Co., Inc., 800 Union Ave., Bridgeport 7, Conn. Its greater range and larger table permit boring, drilling, and reaming of



holes in dies, jigs, and production parts. Features include 11" x 24" table, 20-13/16" height allowance, hardened precision ground steel ways, and 60 to 2250 rpm speed range. Get details from Moore, or Circle Inform-A-Gram No. C6.

400 Components for Jigs and Fixtures and 200 clamping items are covered in a catalog from Northwestern Tool & Engineering Co., 116 Hollier Ave., Dayton 3, Ohio. A scale size tracing template of all jig and fixture components is included. Dimensions in chart form are given for each type of part. Write to the company for your copy of Catalog 28, or Circle Inform-A-Gram No. C7.

Contur abrasive discs STAY ON THE HOLDERS!

IN ACTUAL TESTS ON TITANIUM

"Contur" discs stayed on the holders until discs were worn out.

Adhesive type discs flew off the holders within 15 seconds, due to high friction heat.

All Grits, in sizes: ¾"-1"-1½"-2"-3"-4"

"Contur" flexible abrasive discs provide accurate centering and remain concentric with grinder mandrel at ALL SPEEDS.* They follow the surface grinding cleanly and without gouging flat, convex or concave surfaces.

"Contur" all-metal disc holders are precision-made and will wear indefinitely. Bayonet-locking method and spring-loaded centering pin engage disc for perfect alignment and balance. No wobble, vibration or dangerous fly-offs.

Operating speeds to 80,000 RPM depending on size.

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- SURE LOCKING ✓
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- TIME SAVING ✓
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- Tapped Holes
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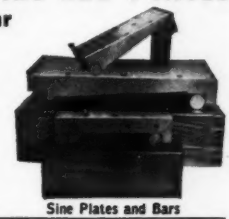

Sine Plates and Bars

No.	Cent. Dist.	Width	Price	With Oak Case
1605	5"	3"	39.95	45.50
1610	10"	5"	87.50	95.00
1705	5"	1"	26.50	30.75

FOB St. Paul
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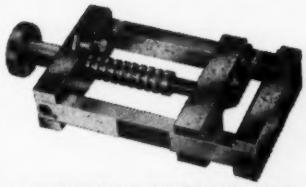
CIRCLE INFORM-A-GRAM KEY NO. 912

ESSENTIAL



PRODUCTO TOOLROOM VISE

Producto's Precision Toolroom Vise is essential equipment for your jig borers, surface grinders, drill presses, tappers. It's extremely strong, yet weighs only 13 lbs. and has a 2" high frame. Has large jaw opening, will clamp heavy as well as light workpieces. All surfaces hardened and ground. Works on five surfaces. Write for Bulletin TE2-103.

THE PRODUCTO MACHINE CO.
970 Housatonic Avenue
Bridgeport 1, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 913

Gaertner Toolmakers' Microscope used to measure typical piece part. Co-ordinate range 4" x 2".

Precise measurement to 0.0001" and 1 min. of arc

Gaertner Toolmakers' Microscope

Here is a reliable, easy-to-use microscope for precise measurement of piece parts, tools, dies, thread gages, templates, jigs, fixtures, etc. Ideally suited for making a wide variety of precision measurements and is especially valuable in reducing rejects in production work.

With the Gaertner Toolmakers' Microscope you make direct, non-destructive measurements — no contact, no distortion, images are sharp and clear. It is a basic measuring instrument for inspection depts., gage labs, tool and die and model shops, industrial and research labs.

The Gaertner Toolmakers' Microscope has been proven in use by U. S. Government Gage Laboratories, and by prime contractors and their subcontractors. With all parties using the same measuring instrument, inspection procedures are co-ordinated and disagreements and rejects minimized.

Features that help you get
HIGH SETTING AND REPEATING ACCURACY

- Low, compact built-in rotary stage reads to 1 minute of arc throughout 360° range.
- Minimum overhang of stages.
- Full 2" precision-lapped lead screws with correction device.
- Straightforward, direct, uncomplicated optical system.

Features that assure you of
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- Independently rotatable cross hairs in protractor ocular speed up measurements, simplify measuring procedure.
- Convenient location of ocular eyepieces for ease of reading.
- Built-in transformer and plugs for all illuminators.

Modifications and accessories to
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- Thread and radius templates, camera and spotting attachments, fine motion focus, variable magnification available.
- If you have a special measuring problem, our staff of representatives will be happy to consult with you. The service and engineering facilities of the manufacturer are always immediately available to help you.

Write for Bulletin 147-56

Designed and manufactured by

The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335
CIRCLE INFORM-A-GRAM KEY NO. 921

Q-C and Inspection

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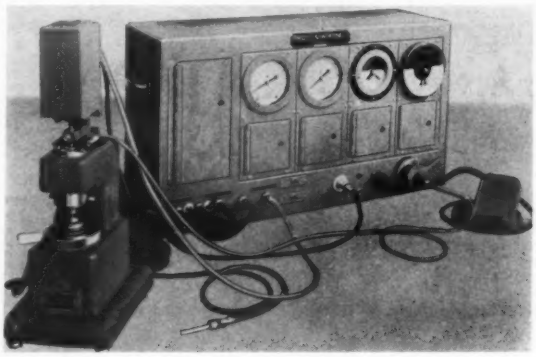
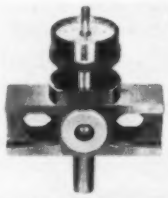


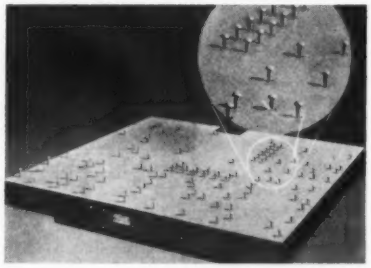
Check Ball Bearing preload and end play with the Air-O-Limit preload-end play gage. It statically and dynamically checks to determine relative face flushness of miniature and instrument size ball bearing races. Bearings from 0.040" bore to 1" OD can be checked to 0.000020" direct reading on preload scale. Pratt & Whitney Co., Inc., W. Hartford 1, Conn., or Circle Inform-A-Gram No. D1.

Relapping Facilities for granite surface plates are described in a bulletin which explains that relapping can be done in any of three standard grades of tolerance with accuracies to 0.00001". Care and maintenance hints are also included. Get Bulletin 101 from Herman Stone Co., 1860 N. Gettysburg Ave., Dayton 27, or — Circle No. D2.



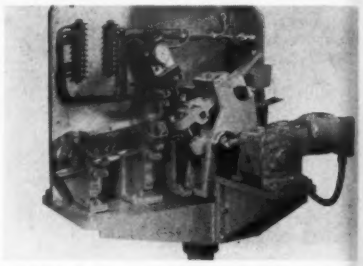
This Micrometer Indicator improves quality control and reduces waste of machine parts. Add indicator to flush pin gages to read thousandths over or under normal to salvage parts or reset machines. There are only 14 parts (one movable) in the indicator, available from Holmes Gage & Development Corp., 537 Bonham Ave., Columbus 3, Ohio, or Circle Inform-A-Gram No. D3.

Granite Surface Plates with threaded inserts have been announced by Rahn Granite Surface Plate Co., 638 N. Western Ave., Dayton 7, Ohio. The inserts make it possible to



attach various components to the plate and to use granite angle plates. For information, write the company, or — Circle No. D4.

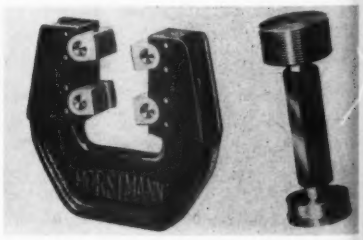
Check Large Integral-Flanged Gears with the new automatic gear gaging and sorting machine introduced by National Broach & Machine Co., 5600 St. Jean, Detroit 13. The



pedestal-mounted unit checks gears produced by hobbing, shaping, or shaving operations. For information, write the company, or Circle Inform-A-Gram No. D5.

An Instruments Catalog gives information on universal optical tooling, analytical metrology, and precision optics. Dimensions and illustrations are given for equipment, and application data is also included. Get your copy from Engis Equipment Co., 431 S. Dearborn St., Chicago 5, or Circle No. D6.

This Caliper External Thread Gage has sets of Go and No-Go fixed jaws to facilitate the checking operation and speed shouldered work handling. The Horstmann gages are ideal for measuring soft



metals because the fixed jaw arrangement gives a better feel of the components and eliminates shearing action. Production Equipment Co., Glenolden, Pa., or Circle Inform-A-Gram No. D7.

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The UNIPUNCH METHOD uses a wide range of standard *interchangeable* units and parts to lower production costs. This method permits any number of units to be set up quickly outside the press, placed on press bed and produce finished parts with first stroke of press ram.

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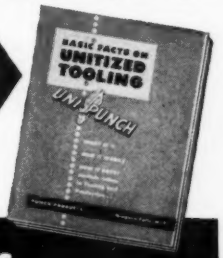

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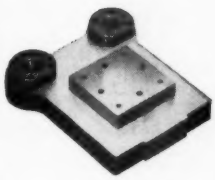
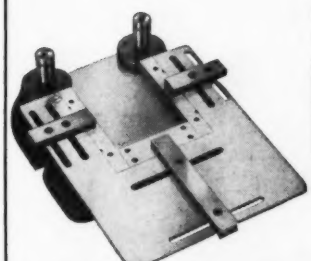
Punches and Dies

Notching Die with Gauge Table





Standard stock sizes 4", 5" and 6". Lick those Notching Problems QUICKLY. Gauge table and gauging bars provide accuracy and speed with easy adjustment.

This is another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Precision made from high grade tool steel. Also adaptors and die shoes to convert your press.

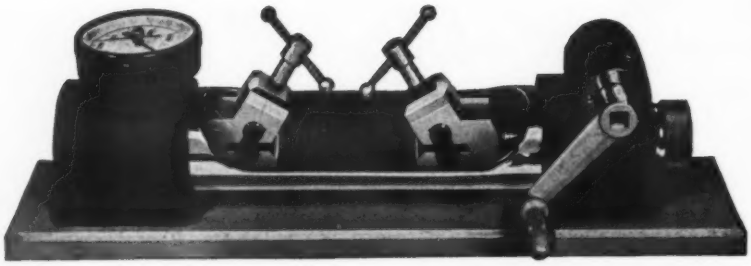
27 *years of serving your punch and die requirements.*

What are your punch and die needs? Consult us about your problems. Prompt service on "Specials" made to your order.

SEND FOR FREE CATALOG No. 157 AF, Illustrating our standard punches and dies and complete line of modern sheet metal fabricating equipment. Net prices shown.

WARD Machinery Co. 564 West Washington Chicago 6

CIRCLE INFORM-A-GRAM KEY NO. 934



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Use this compact, precision tensile tester to test strip steel, wire, bolts, spot welds, or anything else within its 4,000 lb. capacity. Besides its use for inspection work in the shop, this portable device provides a convincing method of demonstrating the tensile strength of various materials in sales demonstrations and trade shows.

Only a moderate pull on the crank is sufficient to apply the maximum load. Results are easily read from the load gauge. Simple to use, anywhere, any time. Write for catalog sheet and price.

DETROIT TESTING MACHINE COMPANY

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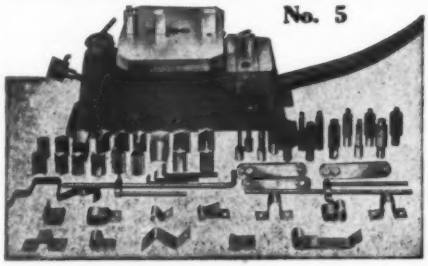

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Plastics

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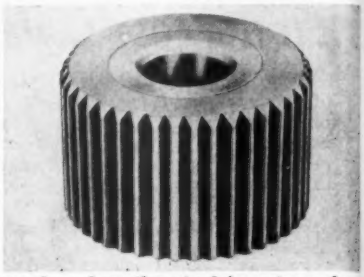
A New Drill Bushing is used in plastic tooling and eliminates the problem of spin-out due to overheating. Redskin bushings have an encasement that resists temperatures of over 600°F. They discolor and



smoke when the steel insert reaches 400° to 500°F, providing ample warning of improper drilling practices. American Drill Bushing Co., 5107 Pacific Blvd., Los Angeles 58, or Circle Inform-A-Gram No. E1.

For added Structural Strength in applications such as tooling, and chemical and other low pressure molding, use the new split glass cloth tapes in widths up to 12". Finished to be used with all molding resins, the tape's uniformity and flatness allow maximum wetting out with resins and insures a void-free laminate under closely controlled tolerances. Get details from Flightex Fabrics Inc., 93 Worth St., New York 13, or Circle No. E2.

"Good Plastics Design . . . Makes Cents" contains good and bad design techniques to help plastics designers. Taper, wall thickness, straightening devices, threads, and inserts are some of the sections included. Write to American Insulator Corp., New Freedom, Pa., for a copy of this booklet, or Circle E3.

Save Money by using the Royal headed pins in plastic molds. They are installed into the moveable pin plate-pin holder by set screws which allow the individual pins to be replaced easily. These versatile pins for multi-core pin hole molding which come in over a hundred sizes, are all centerless hone finished with soft heads. For information, write Durant Tool Supply Co., 1-15 Thurbers Ave., Providence 5, or E4.

For Faster and Lower Cost Tooling and equipment use Epolite 90 laminating system discussed in a bulletin. Detailed physical properties are listed in chart form, and the type of work which can be done with this method is shown. Get your copy of Bulltin RPD 900 from Renolin, Inc., 1651 18th St., Santa Monica, Calif., or Circle No. E5.

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You save on cost!
ARC-FIT® notches up to 720 per hour.
ARC-SNUG prepares pipe ends for snug brazing—up to 500 pieces per hour.
ARC-TWIN® double notches pipe up to 750 pieces per hour.
CUT-OFF shears tubing in two up to 2000 per hour.
Samples of shearing and notching (also estimates) gladly furnished without obligation.
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ARMSTRONG
SET-UP and HOLD-DOWN TOOLS
ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.
Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.
Write for circular
ARMSTRONG BROS. TOOL CO.
5220 W. Armstrong Ave., Chicago 46, U.S.A.
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Tomco INC.

HAND WHEELS Straight Type Offset Type

SPECIALS

- HAND KNOBS
- MACHINE HANDLES
- HANDLES
- BALL HANDLES
- LEVERS
- SPECIALTIES

GRADUATED DIALS

SPECIFY TOMCO FOR DEPENDABILITY

A Complete line of high grade hand knobs, levers, handles, hand wheels, graduated dials is available for immediate shipment from stock of standard items. Specialty items made to your specifications.

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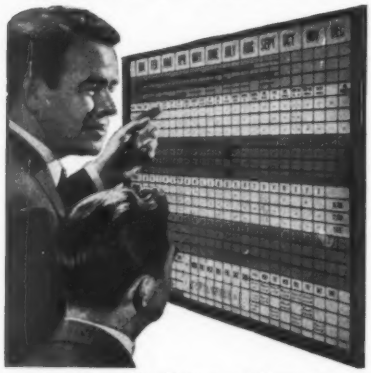

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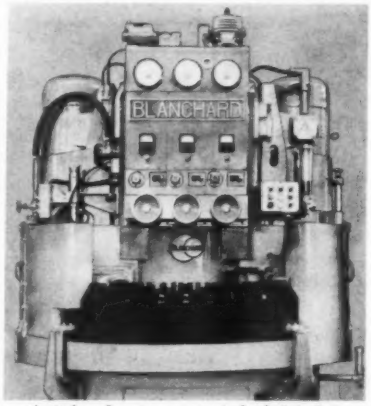
CIRCLE INFORM-A-GRAM KEY NO. 962

Grinding & Finishing

PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

This Center Column Automatic Surface Grinder with 80" OD worktable and three grinding wheel spindles has been introduced by The Blanchard Machine Co., 64 State St., Cambridge, Mass. Each wheel is



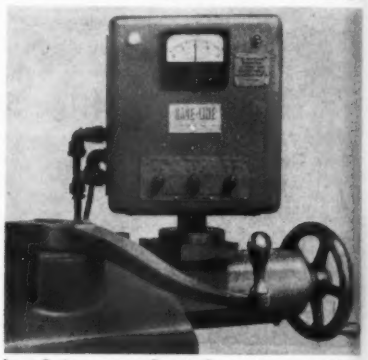
maintained at correct height by a new finger-type feed control caliper. Model 80-A3 (shown) is used to rough grind both sides of both ends of automotive connecting rods. Get information by writing to the company, or Circle No. F1.

Compounds Designed for Deburring, burnishing, and descaling metals in barrel operations are discussed in a booklet published by Oakite Products, Inc., 157 Rector St., New York 6. Tips on how to preclean parts and select media are also given. Get your copy from the company, or — Circle No. F2.

A Hand Feed Surface Grinder is the subject of a bulletin from Harvel Co., 5135 Coffman-Pico Rd., Pico, Calif. Detailed construction features, dimensional drawings, and a list of specifications for the Model 1016 are included. Get your copy from the company, or — Circle No. F3.

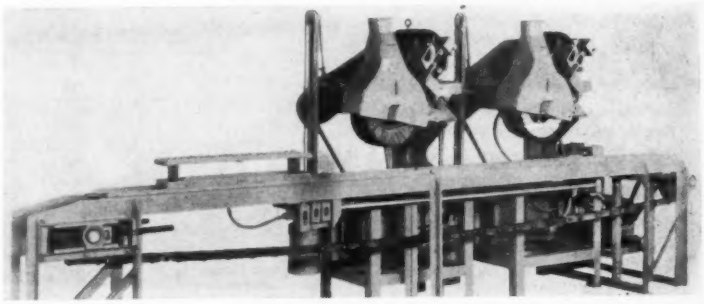
A Heald Rotary Surface Grinding Machine, Model 161, is featured in a bulletin which tells how the machine accommodates such work as saw blades, slitters, and gear cutters. Complete specifications, detailed diagrams, and advantages are given. Get Bulletin 2-161-1 from The Heald Machine Co., 4 New Bond St., Worester 6, Mass., or Circle No. F4.

A New Taper Correction Attachment obtains exact alignment of the swivel table to assure accurate grinding. The gage line consists of two gage heads mounted on the swivel table and an electronic control unit, mounted on the bed, which translates the signal from each gage



head to a graduated meter reading direct for amount of movement and length of workpiece. Get Publication G-687 from Grinding Machine Div'n, The Cincinnati Milling Machine Co., Cincinnati 9, or — No. F5.

For Precision Finishing of metal and plastic parts, use Multi-Forms, standard size and shape media. Triangles and cylinders in a variety of sizes permit selection of the correct media for a specific job so that Multi-Forms will not lodge in the workpieces. BMT Mfg. Corp., Elmira Heights, N. Y., or — F6.



Fully Automated Buffing Operations are now possible with the new Wilson reciprocating buffing machine. It's designed for high and low production runs and handles parts up to 4' long in continuous operation and up to 20' or longer with proper conveyors. This model is a complete package and can be set up for immediate use. Wilson Buffing Chuck & Machine Co., 22730 Dequindre, Warren, Mich., or Circle Inform-A-Gram No. F7.

NEW Sesco "Push-Button" FEED LINE FOR FEEDING HIGH TONNAGE COILS

- powerful enough to handle heavy tonnage coils
- ruggedly built to assure long operation life
- compact in design to save valuable floor space
- push-button controlled for automation at its best
- individual units may be purchased separately

Perfected by Exacting Pressroom Testing To Greatly Reduce Production Costs.

POWER LIFT LOADER
- Self contained—Electrically operated.
- Designed for the requirements.
- Is Push Button Controlled for Coil Positioning.
- Base Construction is rugged and stressed to Receive the loads of Both equipment and coils.

HEAVY DUTY CENTERING REEL
- Handles with ease all selected coil weights.
- Mandrel provides expansion that will do away with loose pieces such as adaptors or shims.
- Push Button controls for Expansion—Payoff and Rewind.

POWER DRIVEN STOCK STRAIGHTENER
- Provides pre-set and re-set adjustment for positive and precision positioning of upper straightening rolls in relation to lower straightening rolls.
- Input and output pinch rolls provide powerful non slip material processing.
- The diameter and number of Straightening rolls are determined by the Material Specifications.
- Vertical actuation of upper rolls may be powered or manual.

HYDRAULIC DOUBLE GRIPPER FEED
- Is positive, accurate and reliable with an infinite stroke adjustment within its specified range.

Sesco INC. 8881 Central Detroit 4, Mich.

engineers & manufacturers of machine tools and press room equipment

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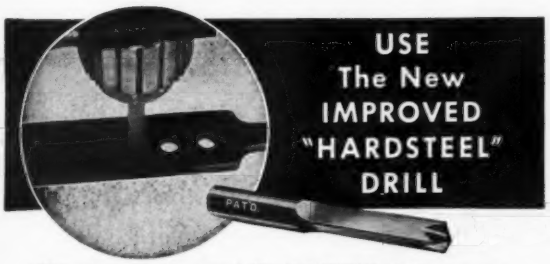
Drill Hardened Steels without Annealing—



With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon—high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It—
With "HARDSTEEL"

BLACK DRILL COMPANY, INC.
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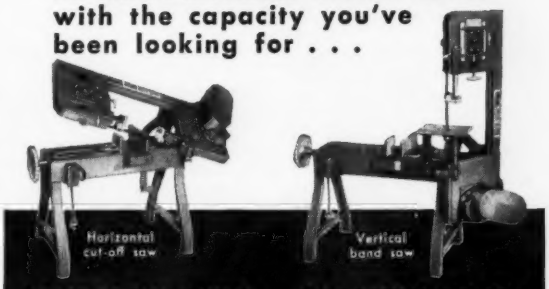
"HARDSTEEL"

CIRCLE INFORM-A-GRAM KEY NO. 972

The New WELLS MODEL 58-B A CONVERTIBLE BAND SAW

with the capacity you've been looking for . . .



COMPACTLY BUILT • MODESTLY PRICED

Here's the all new Wells Model 58-B . . . a metal saw designed and built for double duty—double value. It's a compact, rugged, well guarded, extremely versatile unit . . . economically priced. As a horizontal cut-off saw, Model 58-B features quick-action vise (swivels to 45°); automatic shut-off; adjustable guides. Capacity: 6" x 10" rectangular shapes; 6" dia. rounds. For vertical use, swing head to upright position and install work table. Optional wheel-handle unit provides complete mobility. Write for complete information.

The Pioneers of Horizontal
METAL CUTTING BAND SAWS

Wells

WELLS MANUFACTURING CORPORATION
1940 Cedar St., Three Rivers, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 973

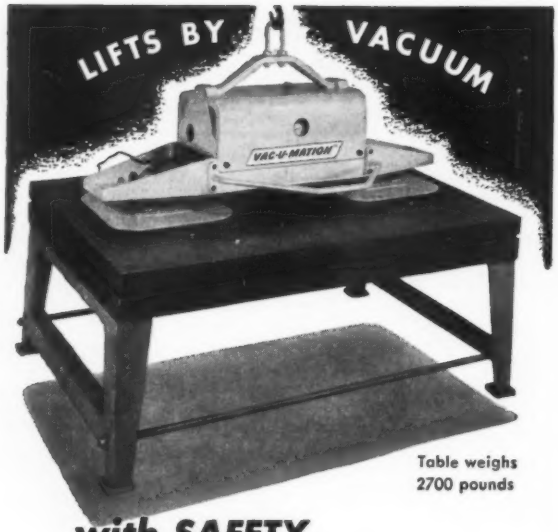


Table weighs 2700 pounds

with SAFETY and ECONOMY

VAC-U-MATION SHEET LIFTERS shorten man-hours, cut handling costs, pay for themselves F-A-S-T. Models available from manually-operated units to completely automatic models with capacities for handling up to 2,000 lbs.

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LITTELL — VAC-U-MATION DIVISION
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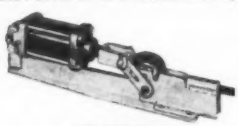
INTRODUCING...
3 NEW KNU-VISE CLAMPS

P&P-1200
Hand Push-and-Pull Clamp

P&PSB-1200
Hand Push-and-Pull Swivel-Base Clamp



AOP&P-1200
Push-and-Pull Air-Operated Clamp

WRITE TODAY FOR COMPLETE INFORMATION

Push the handle! Pull the handle! It makes no difference—the new Knu-Vise clamps by Lapeer give you uniform clamping of parts. That's real performance! Look at these features—

90° handle motion produces lock of plunger for push or pull without re-setting of handle. Handle is reversible. Plunger guided by two widely separated, hardened steel bushings for accuracy in motion and minimum wear. Built-in deflection provides uniformly tight clamping of parts with normal variation in thickness. Swivel base model provides 90° total change in direction of plunger motion. The air (or oil) operated model, AOP&P-1200, produces approximately 4½ times the clamping force with 85 p.s.i. than the cylinder would alone. Failure of air (or oil) pressure does not permit reverse motion of plunger, thus not affecting clamping force.

All parts easily replaceable.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

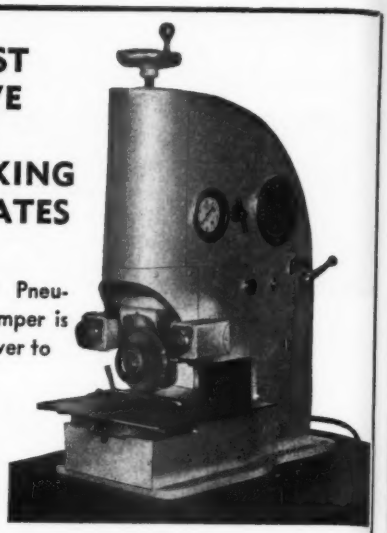
KNU-VISE PRODUCTS — LAPEER MANUFACTURING CO.

3064 DAVISON ROAD
LAPEER, MICHIGAN

WESTERN DIV.: PECK and LEWIS CORPORATION
4436 Long Beach Ave., Los Angeles 58, Calif., ADams 3-7148
CANADIAN DIV.: HIGGINSON EQUIP. SALES LTD.
1131 Pettit Road, Burlington, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 982

THE MOST EFFECTIVE METHOD OF MARKING NAMEPLATES



The new GTS Pneumatic Plate Stamper is the modern answer to clean, accurate plate marking.

This GTS designed and built machine guarantees that your plates will be marked with precision in alignment, spacing and depth of characters. The fatigue of hand stamping is eliminated.

For speed, safety, economy and power, GTS has all the answers to your plate marking problems.

IF IT'S WORTH MAKING, IT'S WORTH MARKING.

GEO. T. SCHMIDT, INC.
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Chicago 13, Illinois

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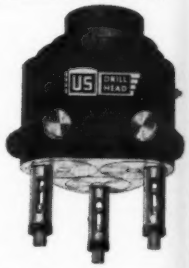
Q. Are you drilling holes in your MONEY POCKET?

A. *NOT* when you use *U. S. DRILL HEADS!*



Standard Adjustable style is made in 5 models—58 sizes.

That's because Adjustable U. S. Drill Heads are designed and built for profit-making performance!

Positive all-gear drive . . . Shaved gears . . . High factor of safety in design . . . Anti-friction bearings . . . Double Duty tools—with a reversing spindle, you can drill and tap the same hole pattern with one head.

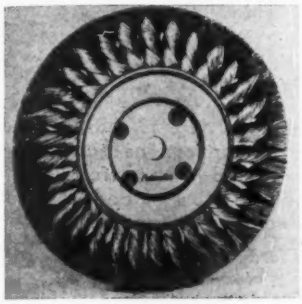
Write for Catalog AD-57. Or, send specifications of requirements.

US DRILL HEAD
Adjustable and Fixed Center Multiple Drilling Heads.
Individual Lead Screw Multiple Tapping Heads.
UNITED STATES DRILL HEAD CO
BURNS STREET • CINCINNATI 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 984

A Non-Etching Reverse Current Cleaner, Composition 195, is described in a folder. It removes soils without darkening the zinc or changing the color achieved in preceding buffing operations. Application procedures are given in Folder F10466, available from Oakite Products, Inc., 157 Rector St., New York 6, or Circle Inform-A-Gram No. F8.

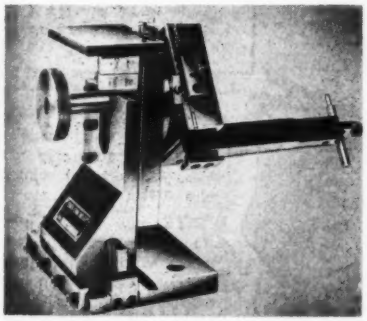
True Dynamic Balance is added to the construction of Anderson spiral twist wire wheel brushes. Both sides of the flange are now provided with a covering plate scientifically



designed to make every brush run true even at high speeds. The Anderson Corp., 1029 Southbridge St., Worcester, Mass., or Circle Inform-A-Gram No. F9.

"Tumbling Media for Barrel Finishing" is a 20-page booklet which explains tumbling media types and applications, and functions of tumbling barrels, compounds, and cleansers. There's also a list of "do's and don'ts." Get a copy from The Carborundum Co., Electro Minerals Div'n Niagara Falls, N.Y., or Circle Inform-A-Gram No. F10.

Grind Any Amount of radii and tangent in one setup without moving the dresser with this new Zenith 1-B form dresser. The size of the radii corresponds exactly with the



gage blocks used. The dresser can be used on the side of grinding wheels or as a "whirl-a-jig." R & A Tool & Engineering Co., 7338 Woodward Ave., Detroit 2, or Circle Inform-A-Gram No. F11.

A New Concept of Brushing Tools for power finishing is discussed in a bulletin which points out the new Osborn Ty tools. These brushes can be economically used where rotary files, abrasives stones, or belts are used. Get details from a bulletin, offered by The Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, or Circle Inform-A-Gram No. F12.

Details of Norton's Precision Grinding and Lapping Machines are given in a revised catalog. General features of the cylindrical, angular, multi-wheel, cam, universal, and tool and cutter grinding machines are

Grinding & Finishing

PRODUCTS & PROCESSES & PRODUCTS

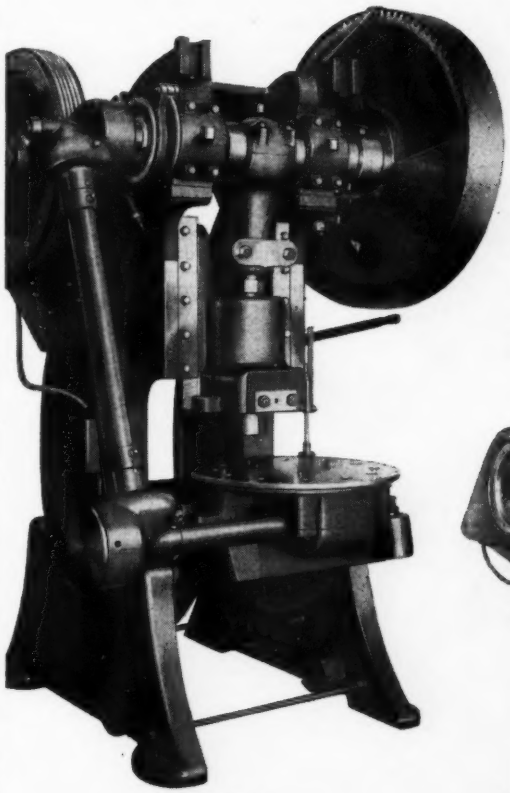
presented. Specifications are given in the bulletin, available from Norton Co., Worcester 6, Mass., or Circle Inform-A-Gram No. F13.

Precision Finishing by barrel and wet blasting methods is discussed in a pamphlet that also gives applications and data on media, compounds, and abrasives necessary for either method. Obtain your copy of Vol. 1, No. 1 of this publication from Techlien Div'n, Wheellabrator Corp., 1183 Avenue V, Vicksburg, Mich., or Circle Inform-A-Gram No. F14.

Modern FEDERAL Dial Feeds give you

automation at less cost!

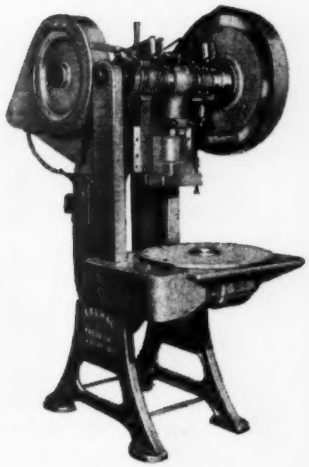
—eliminate specialized and more costly equipment!



No. 7 Dial Feed
Gear Driven. Capacity, 80 tons.

Federal Dial Feeds are your answer to greater production at lower costs. Equipped with special jigging, automatic feeds and ejectors, their applications are virtually unlimited and the need for specialized, more costly equipment often eliminated. (Example, one manufacturer increased production 600%.)

Add Federal's quality features and workmanship... and you've got a winner. Investigate Federal Dial Feeds for your operations. Gear or chain driven with cam-type indexing mechanisms. Sizes range from 6 to 80 tons.



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FEDERAL DIAL FEED PRESSES
33 Years' Experience in Dial Feed Engineering and Construction

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New One-Piece
"Conelok"
with prevailing torque

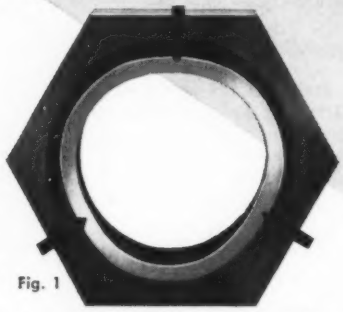

Fig. 1

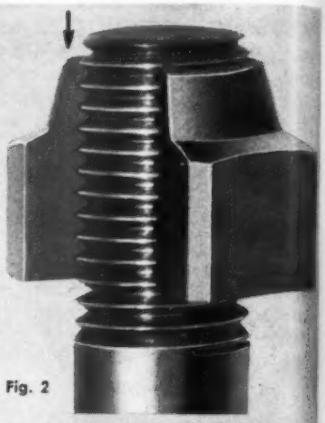

Fig. 2

Three sectors of the tapered portion of the CONELOK nut are preformed inwardly (Fig. 1). When the Nut is applied to a bolt, these conforming sectors are elastically returned to a circular configuration and create an inward and downward pressure which produces intimate contact between the load carrying flanks of the nut and bolt threads (Fig. 2). The shape of the cone sector displacement insures conformity with the mating bolt and maximum friction contact area. . . . The closed stress path in the locking portion of the nut and the advantageous distribution of locking pressure, produce a locking device of high fatigue life . . . and equivalent locking force is exerted at only a fraction of the stress of any slotted type locknut. CONELOK maintains its locking action through many re-applications. . . . It is adaptable to high, and low torque assemblies . . . to high torque stop-nut applications . . . and may be obtained in sizes from No. 10 through 1½", Full and Thick dimensions are "Standard". . .

Send for brochure which includes complete engineering specifications.

NATIONAL MACHINE PRODUCTS COMPANY
an SPS company 44250 UTICA ROAD UTICA, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1001

NEW CARL ZEISS JENA
LARGE TOOLMAKER MICROSCOPE
...PRODUCES HIGHEST PRECISION ....CUTS INSPECTION TIME

At Last...
available again the ORIGINAL
CARL ZEISS JENA
New Type
LARGE TOOLMAKER MICROSCOPE

. . . **actually measures** (not only compares drawings or shadows) any type of work for shape, angles in degrees and minutes, radii, distances between holes, tapers, spacings, width of keyways and splines, graduations, thread check for angle of flank in minutes, lead and pitch errors of taps, chasers, hobs, cutters and other irregular work **which cannot be checked in any other way.**

RANGE: 6" x 2" — BUILT-IN ROTARY TABLE (11" Diameter) thru 360°

GET THE FULL STORY OF THE VERSATILITY OF THIS OUTSTANDING SHOP AID — Request Circular

GEORGE SCHERR CO., Inc.
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BURR-BIT CUTS TAPPING COST WAY-DOWN!

Just lock Burr-Bit on any make tap and holes are deburred automatically, leaving a smooth clean chamfer. ONE OPERATION, ONE SETUP, ONE HANDLING.

NEW ADDITION
Now Burr-Bit fits 3 fluted taps from #6 to ½". Also available to fit any tap 2 or 4 fluted from #2 to ¾".

A quality product made of the finest high speed tool steel for use on almost every material.

WRITE now for complete data and reports from engineers who have adapted Burr-Bit and saved on their tapping operations.
INVESTIGATE Burr-Bit-today.

VERNON DEVICES, Inc.
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CIRCLE INFORM-A-GRAM KEY NO. 1003

Grinding & Finishing

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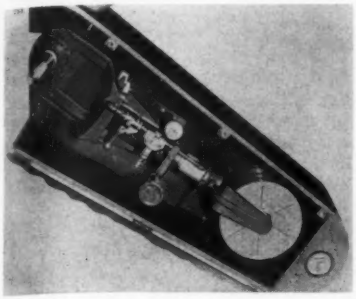
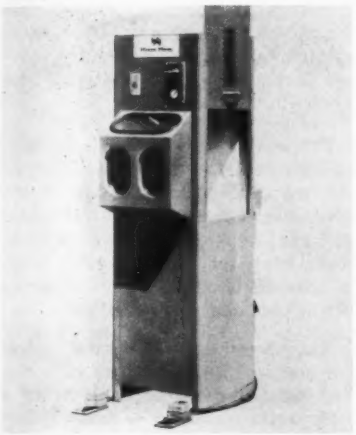
This Air-Operated Abrasive Belt Attachment converts any polishing and buffing head unit or lathe to accommodate abrasive belts. When used with abrasive belts, a contact wheel is mounted on the head or



lathe unit spindle and the abrasive belt is placed over this contact wheel and the idler pulley of the attachment. Divine Brothers Co., 200 Seward Ave., Utica, N. Y., or Inform-A-Gram No. F15.

A New Low Cost Liquid Blasting Machine for high production and precision cleaning, finishing, peening, burnishing, and deburring of metal parts has been announced by



Hydro-Hone Corp., 7516 Pacific Blvd., Huntington Park, Calif. Model 15 maintains micro-finishes ranging from 16 to 250 and can be adapted to existing air supplies. For information, write the company, or Circle Inform-A-Gram No. F16.

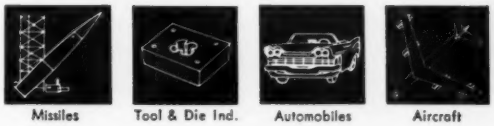
For additional information about advertised products and editorial items, circle the correct number on the Inform-A-Gram card which follows page 86 and mail it to us today.

Electrolytic Metal Removal

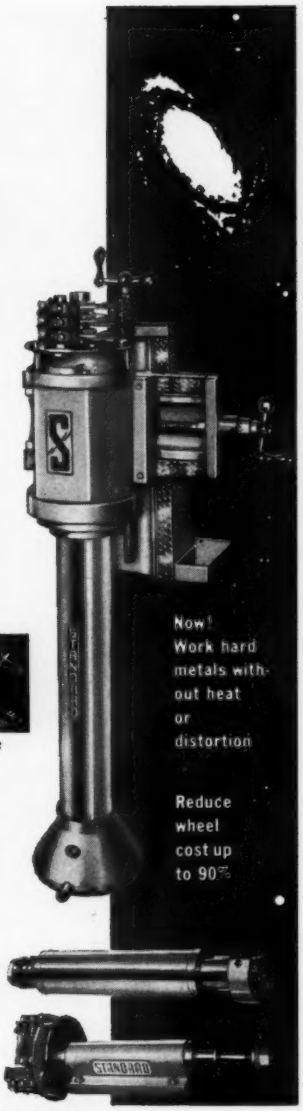
Potential Unlimited

This new procedure has solved hitherto unsolvable problems, and greatly increased capacity and quality in virtually every application.

As pioneers in this very "young" development, we can offer you real help in licking hard metal removal problems, with actual installation and performance data. **WRITE TODAY!**



Results depend on the spindle used. There is nothing finer in its field than a STANDARD Super Precision Spindle . . . available for electrolytic application in 50 to 3000 Amperes.



THE STANDARD ELECTRICAL TOOL CO.
Precision Spindle Division
Mt. Hope & Sixth Sts., Cincinnati 4, Ohio
CIRCLE INFORM-A-GRAM KEY NO. 1011

GRINDS METAL SAWS *in Gangs* AUTOMATICALLY

WARDWELL's 57T Cuts Costs—makes money for you. Will sharpen as many as 250 Milling Cutters, Slitting and Screw Slitting Saws .015" thick at one time with a variation, plus or minus .001" of exact diameter for entire lot. Automatically indexes the gang of saws, one row of teeth at a time. Grinds either wet or dry.

A Time and Money Saver

Write for Bulletin 57T

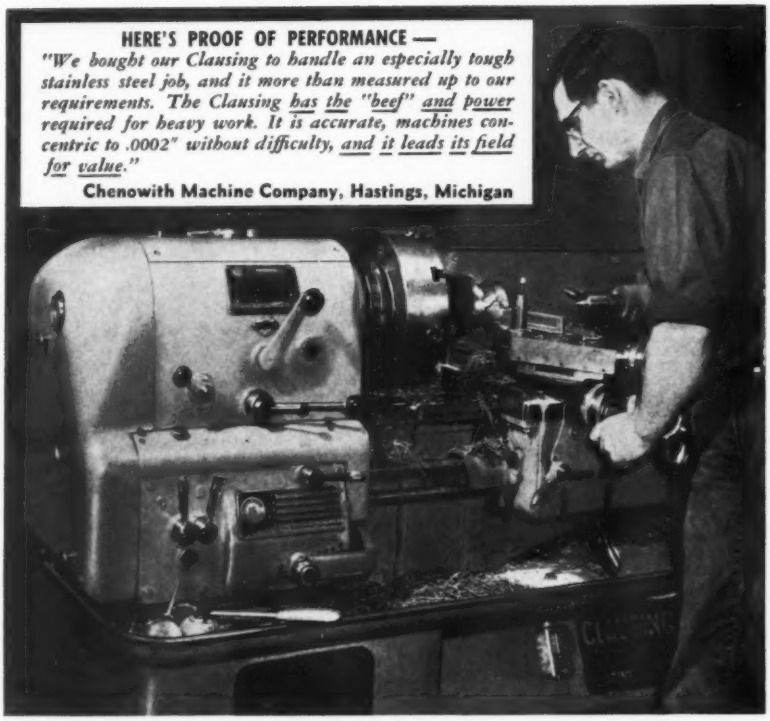
WARDWELL
3809 Ridge Road
Cleveland 9, Ohio

57T
Maker of Largest Line of Saw and Tool Sharpening Machines
CIRCLE INFORM-A-GRAM KEY NO. 1012

HERE'S PROOF OF PERFORMANCE —

"We bought our Clausing to handle an especially tough stainless steel job, and it more than measured up to our requirements. The Clausing has the "beef" and power required for heavy work. It is accurate, machines concentric to .0002" without difficulty, and it leads its field for value."

Chenowith Machine Company, Hastings, Michigan



Performance records PROVE

COLCHESTER CLAUSING LATHES'

Superior Construction ... Greater Value

Clausing geared-head lathes do lead their field in capacity, performance and value, Here's why:

They're bigger in capacity than other lathes in their class. Larger spindles, larger thru-hole capacity, larger bearings for heavier work. 17" lathe spindle, for example, has 3 1/16" thru hole – 15" lathe, 2 1/16" hole – 13", 1 1/16" hole.

Have heavy-duty construction. Massively built throughout. Bed ways are induction hardened. Gears in head and quick-change box run in bath of oil. Power feeds are taken from separate feed rod, lead screw is used for thread cutting only. Spindles are high-tensile steel.

Built for precision performance – to American standards of toolroom lathe accuracy. Have Gamet Micron tapered roller bearings with oil flow lubrication – the most advanced and accurate bearings known to industry.

Each is an outstanding value. 13" cabinet base models, including motor and controls, start at $2113; 15" cabinet base at $2988; 17" at $4715. You owe it to yourself to investigate before investing in *any* lathe.

Lathe Capacities: 17" lathe: 54" and 78" centers, 28" swing in gap; 15" lathe: 30" and 48" centers, 24" swing in gap; 13" lathe: 24" and 36" centers, 18" swing in gap.

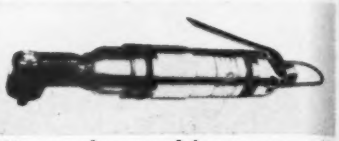
CLAUSING DIVISION *Write for Free Literature*
ATLAS PRESS COMPANY
1-115 N. Pitcher St. • Kalamazoo, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1021

Assembly

PRODUCTS & PROCESSES & PRODUCTS

Drilling or Assembly Operations in close quarters can be done with a new series of Keller air tools. The new lightweight angle drills, nut



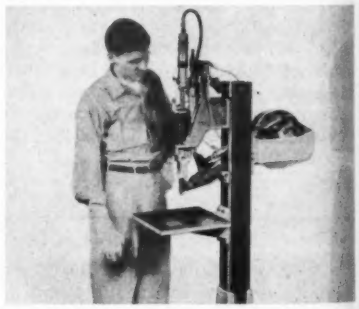
setters, and screw drivers are available in five sizes with speeds ranging from 3200 rpm for small sizes up to 450 rpm for the largest size. Gardner-Denver Co., Quincy, Ill., or Circle Inform-A-Gram No. G1.

Self-Insulating Fasteners for use in high voltage circuits are made by automatically molding plastic heads onto metal fasteners. The mechanical-property advantages of the metal and the electrical-property advantages of the plastic eliminate

the need for separate insulation or insulating assemblies. Gries Reproducer Corp., 400 Beechwood Ave., New Rochelle, N.Y., or Circle No. G2.

Precision Fasteners are highlighted in a bulletin which lists the special features of the types and shapes available, and also tells where these different types of fasteners can be used. For your copy, contact Chandler Products Corp., 1493 Chardon Rd., Cleveland 17, or No. G3.

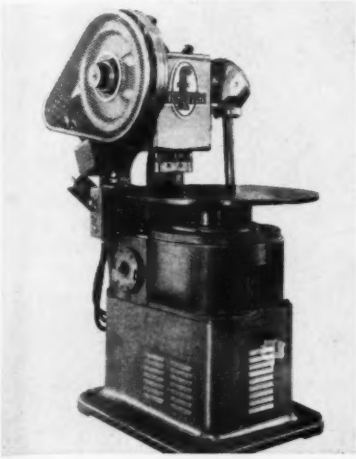
This New and Improved Driver for screws and nuts features a new cage-controlled roller clutch and a new parts feeder. The Auto-Torque driver, available in two models



(Pedestal Model SD-100 shown), handles and drives screws and nuts in sizes from No. 4 screw to 5/16". Dixon Automatic Tool, Inc., 2300 23rd Ave., Rockford, Ill., or Circle Inform-A-Gram No. G4.

PRODUCTS & PROCESSES & PRODUCTS

This High Speed Rotary Transfer Machine has an integral pressing station to perform crimping, riveting, staking, and forming operations in conjunction with automatic assembly or for dial fed secondary press functions in making small

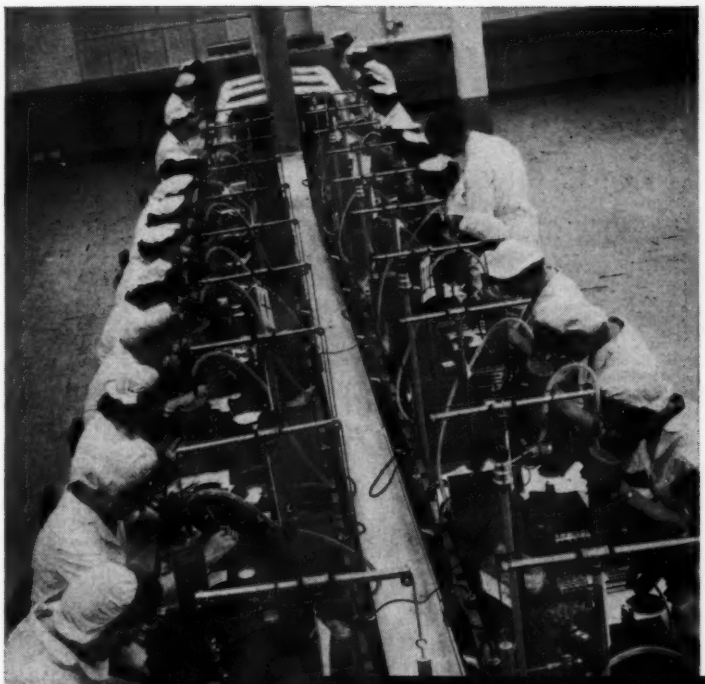


parts. The Type "O" Pressembler incorporates a roller gear drive as the dial indexing mechanism for smooth transfer. Accuracy is 0.001" and capacity of the press station is 14 tons with a 2" stroke. Ferguson Machine Corp. of Indiana, 7818 Maplewood Industrial Court, St. Louis 17, or Circle Inform-A-Gram No. G5.

Increased Welding Speeds and improved control of bead shape are the main advantages of the multiple electrode submerged tandem arc welding, as explained in a bulletin. The process is explained in detail and information on the application opportunities and requirements are discussed. The Lincoln Electric Co., Cleveland 17, supplies copies of Bulletin 5200.2, or Circle No. G6.

For Joining Structural Parts intended for operating temperatures up to 900°F, use the new brazing alloy from American Silver Co., 36-07 Prince St., Flushing, N. Y. Fluxless Nu-Braze 0070 is a lithium-containing silver brazing alloy for application in complicated blind joints like honeycomb structures. For information, write the company, or Circle Inform-A-Gram No. G7.

THE INFORM - A - GRAM CARD FOLLOWING PAGE 86 IS FOR YOUR CONVENIENCE IN MAKING INQUIRIES.



GENERAL ELECTRIC SPEEDS PRODUCTION WITH 3-D MICRO-VISION

How B&L Stereomicroscopes help in assembly of ultra-precision transistors

These skilled operators are doing a job that "just couldn't be done without stereomicroscopes," according to Norman Spoonley, foreman, Semiconductor Products Dept., General Electric Co., Buffalo. This critical phase of transistor assembly involves soldering a 1-mil nickel wire between a nickel tab and the .6-mil core of a .1" germanium pellet which, in turn, is fused between two 5-mil nickel wires. B&L Stereomicroscopes make it possible by showing enlarged views in natural 3D. Air-tight, dust-free design keeps images sharp, clear, undistorted . . . for full-working-day efficiency without visual fatigue. In assembly, quality control, inspection, some 100 B&L microscopes help G. E. mass-produce to highest precision standards. If you have small-parts assembly and inspection problems, you need B&L Stereomicroscopes.

SEE FOR YOURSELF! MAIL COUPON FOR FREE 15-DAY TRIAL

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☐ I'd like to borrow a B&L Stereomicroscope for 15-day trial without cost or obligation.

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CIRCLE INFORM-A-GRAM KEY NO. 1031

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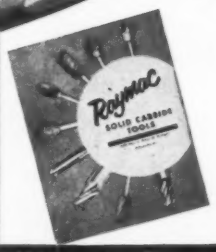
SOLID CARBIDE CUTTING TOOLS

• MIDGET BURRS • ROTARY FILES
• DRILLS • REAMERS • END MILLS
• COUNTERSINKS • GRINDING
TOOLS AND OTHER SPECIAL TOOLS

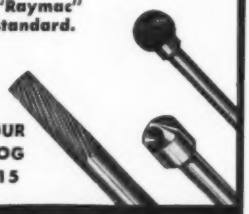
Up to 25% Longer Life

Finest quality solid carbide ground and lapped to the sharpest cutting edges make "Raymac" tools the quality standard of the industry. More parts produced per tool and per regrind.

Make "Raymac" your standard.



GET OUR CATALOG NO. 15



"Raymac" Division—DEXCO CORPORATION
15490 Dale • Detroit 23, Michigan

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FREE... 64 PAGE CATALOG

WORLD'S LARGEST LINE OF WORK HOLDING EQUIPMENT—CHUCK JAW BLANKS, CAST ALUMINUM AND MALLEABLE KNOBS, WHEELS, HANDLES—PLUS HUNDREDS OF OTHER JIG AND FIXTURE COMPONENTS

COMPLETE DETAILED SPECIFICATIONS
ENGINEERING DRAWINGS • COST SAVING DATA
write for your copy—TODAY!

JERGENS TOOL SPECIALTY CO.
Dept. TP1 712 E. 163rd St., Cleveland 10, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1043

ONLY THRIFTMASTER Universal Joint Type DRILL HEADS have these exclusive* features

6 Standard Models

Models U-608 and U-1000—Ball Bearing.
Models U-620B and U-1012B—Plain Bearing. 11/16" or ½" min. centers.
Models U-608-BS and U-1000-BS—Ball Bearing Gear Case. Plain Spindles.

Semi-Standard Heavy Duty Full Ball Bearing

½" in Cast Iron—7⅛" or 9¾" Dia.
½" in Steel—7" or 9⅝" Dia.

Also larger Adaptations and Full Line of Fixed Center Drill Heads.

• Standard Full Ball Bearing Construction including Spindles.

Driving assembly is FULL BALL BEARING mounted with 3 Bearings on each spindle. Thrust load carried by radial thrust bearings.

• Standard Slip-On and Slip-Off Template Construction.

For accurate setting and locating spindle brackets are machined to receive slip-on and slip-off template.

WRITE FOR FULL INFORMATION

THRIFTMASTER Products Corporation
A SUBSIDIARY OF THOMSON INDUSTRIES, INC.

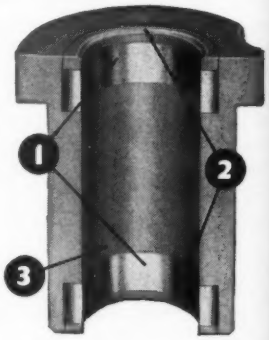
Also Makers of DORMAN AUTOMATIC REVERSE TAPPERS

1012 N. Plum Street
Lancaster, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1042

CARBIDE INSERTED MEYCO BUSHINGS Can Cut Production Costs!

MEYCO carbide inserted drill jig bushings have been successfully saving money on production runs for the past decade. Performance: same as solid carbide, but need not be handled with kid gloves. Greater economy, because of long life at less cost. You can enjoy the advantages of greater accuracy for a longer time, less spoilage, less machine down-time, added drill and jig life with MEYCO carbide inserted drill jig bushings. Get the full story now: write for new Bushing Catalog No. 41



*PATENTED

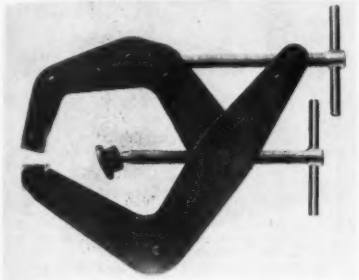
1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

W. F. MEYERS CO., INC., BEDFORD, IND.

CIRCLE INFORM-A-GRAM KEY NO. 1044

Welding Machinery for Automatic Welding is described in a bulletin from Airline Welding Sales, Inc., 750 N. Prairie Ave., Hawthorne, Calif. Specifications and advantages for circumferential welding machines and longitudinal welding positioners are given. Write the company for your copy or Circle Inform-A-Gram No. G8.

A Positioning Screw has been added to a standard Saxton Kant-Twist clamp to give a third hand to the welder. The screw has a swivel-joint-jaw to hold the work in



place. For information, write Saxton Mfg. Co., 1517 N. Potrero Ave., S. El Monte, Calif., or Circle Inform-A-Gram No. G9.

A New Conductive Cement, Hysol 6250, is 100% solids and offers excellent bond strengths to most materials. It's recommended for repair of printed circuits and for bonding electrical components where soldering can't be tolerated. Houghton Laboratories, Inc., Olean, N. Y., or Circle Inform-A-Gram No. G10.

High-Strength, Load-Bearing Threads can now be put into thinner gauge sheet metal with lower installation pressures with the new self-swaging clinch-type nut. This

swage nut can be anchored in sections as thin as 0.020". For details, write Standard Pressed Steel Co., Jenkintown, Pa., or Circle Inform-A-Gram No. G11.

A New Truarc Retaining Ring Catalog features descriptions and illustrations of retaining rings, pliers, and accessory tools. The 24-page catalog has one section giving information on assembly tools which include pliers for axially-assembled rings, applicators and dispensers for radially-assembled rings, and the Waldes grooving tool for cutting retaining ring grooves. Get a copy of Catalog RR 10-58 from Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N. Y., or Circle Inform-A-Gram No. G12.

A New Self-Locking Threaded Insert, E-Z-LOK, requires only standard coarse thread taps and standard bolt or screw driver for installation. They're easily removed, and re-usable, and can be used in aluminum,

magnesium, plastic, or cast iron and tooling and production operations. Tool Components, Inc., 12923 Budlong Ave., Gardena, Calif., or Circle Inform-A-Gram No. G13.

Assembly

PRODUCTS & PROCESSES & PRODUCTS

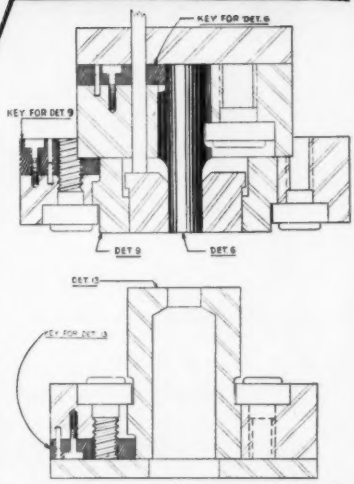
No overheating is a feature of the three lightweight soldering irons with built-in Magnastat temperature controls inside the soldering tip. Correct soldering temperatures are automatically maintained while in use, and heat is concentrated at the tip. Weller Electric Corp., Eaton, Pa., or Circle G14.

NEW
HOVIS KEY-ALIGNED DIE
THE LATEST ADDITION TO OUR STANDARD UNITS

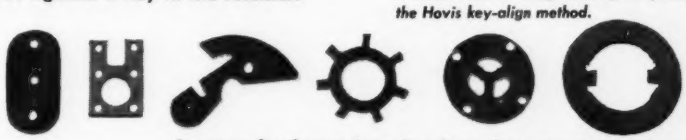
a must for irregular stampings

ELIMINATES ALL SET-UP ERRORS AND INSURES UNINTERRUPTED ACCURACY

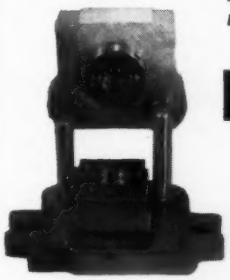
When producing irregular shaped stampings, it is important that the cutting members of the die are located in the proper radial alignment. Hovis has introduced the key-aligned die to meet this requirement . . . With the key-aligned die any press operator can install the inserts without the possibility of misalignment. This is accomplished with a flat on the insert which locates against a key in the retainer.



A section line drawing showing the principle of the Hovis key-align method.



An example of some irregular pieces these dies produce by merely purchasing special sets of parts on which we are glad to quote



Made in 6 sizes:
¾"-1½"-2½"-4"-6"-8"

HOVIS UNIVERSAL COMPOUND DIES

for producing WASHERS and SMALL STAMPINGS . . . No need to make a NEW DIE for every STAMPED PART

By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.

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8100 E. NINE MILE ROAD • BOX 97 • WARREN, MICHIGAN
Phone: Slocum 7-4800 Suburb of Detroit
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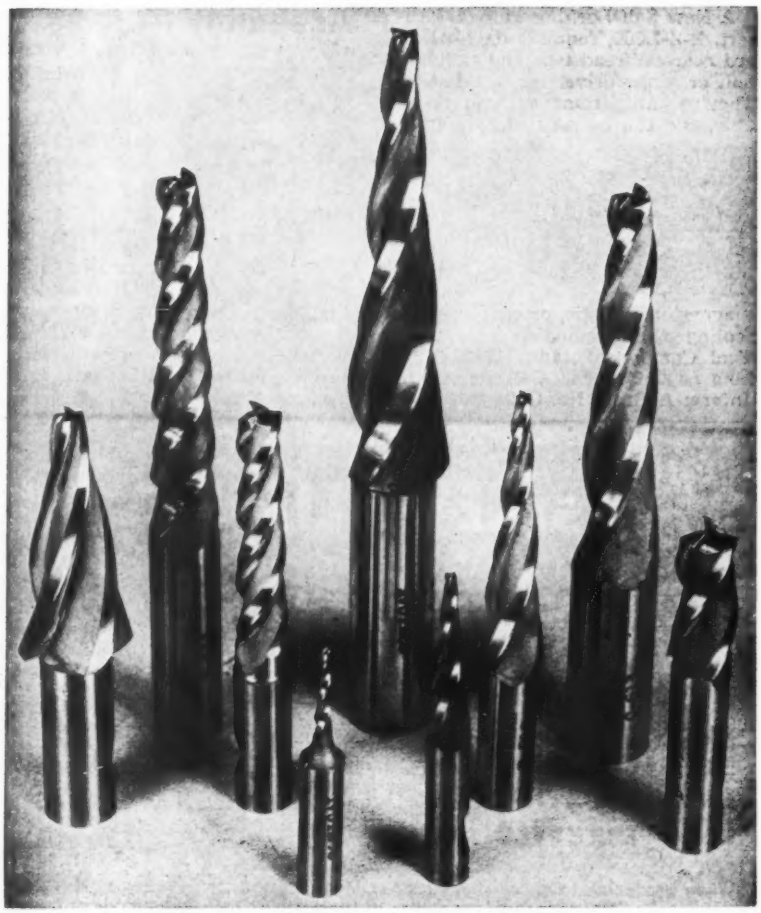

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and forward for our new 16-page catalog.

CONICAL TOOL CO. 3890 Buchanan S.W.
Grand Rapids 8, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1061

DYKEM
STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
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With DYKEM Steel Blue
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has been done with the **SCLEROSCOPE**
Since 1907
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LIFTING DEVICES
for
FAST-SAFE-BETTER
Material Handling
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400 MODELS

Prompt Delivery
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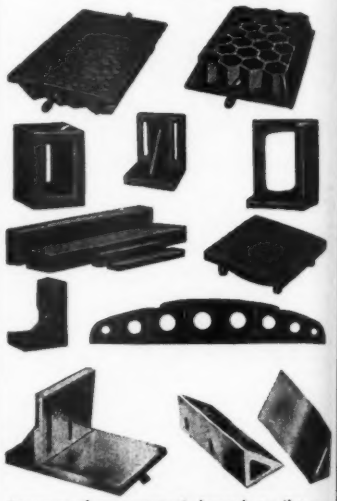
CIRCLE INFORM-A-GRAM KEY NO. 1064

ACCURATE INSPECTION TOOLS



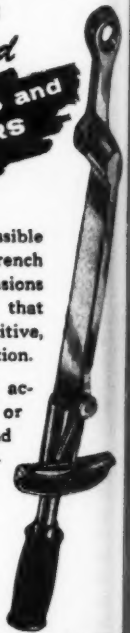
Accuracy of measurement depends on the precision of the measuring tools. Provide your Shop and Inspection Department with dependable and proper inspection tools. MEEHANITE METAL TOOLS, made to close tolerances, are furnished in many types.
Surface Plates—Box Parallels—Slotted Angle Plates—Universal Right Angles—Flat Parallels—Lapping Plates—Toolmaker's Knees—"V" Blocks—Straight Edges (Bridge Type)—Straight Edges (Leveling Type—Measuring Irons—Masterangle Plates—Angle Attachments
SURFACE PLATES RESCRAPED

ACME TOOL CORP.
75 W. Broadway, New York 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1065

Only **ONE** *Torque Wrench can be accurately used with . . .*

EXTENSIONS and ADAPTERS



It is mechanically impossible to use any Torque Wrench with adapters or extensions (with accuracy) unless that Torque Wrench has a positive, built-in, fixed load position.

This essential factor of accuracy, misunderstood or ignored in the design and manufacture of some torque tools, can completely defeat their purpose.

Patented pivoted handle fixes load position

Write for Torque Manual
with formulae tables and explanations for correct use of adapters and extensions.

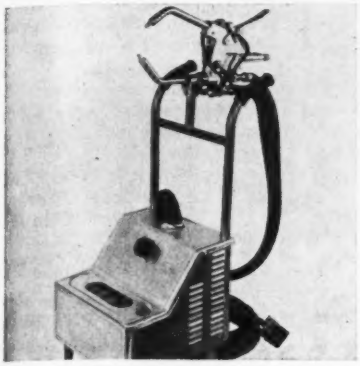
P A STURTEVANT CO
ADDISON (QUALITY) ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1066

Assembly

PRODUCTS & PROCESSES & PRODUCTS

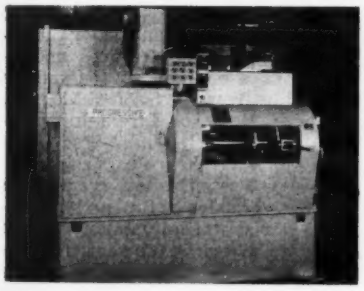
This Manually-Operated Portable Spot Welder is ideal for general shop use and medium production. Model 10 KVA welds two pieces of mild steel up to ⅛" combined thick-



ness, and Model 20 KVA welds two pieces of mild steel up to 3/16" combined thickness. For information, write Peer, Inc., 1200-1248 Milton St., Benton Harbor, Mich., or Circle Inform-A-Gram No. G15.

A New, Economical Filler Metal, Curtisol, was designed for low temperature titanium torch soldering by the Research Div'n, Curtiss-Wright Corp., Quehanna, Pa. Curtiflux, a fluxing agent, is for low temperature silver solders. Write to the company for more information, or Circle Inform-A-Gram No. G16.

For Welding Transmission Shafts to carrier cases with a complete cycle time of only 12 sec/pc, use the automated arc welding machine developed by Progressive Welder Sales Co., Special Machinery Div'n, Pontiac, Mich. The machine automati-



cally welds two dissimilar alloy pieces, without measurable change in tolerance. Write the company for details, or Circle Inform-A-Gram No. G17.

"Socket Screw Products and Headless Set Screw" features a selector chart that gives of over 1,001 combination of metals, locking actions, points, and suggested applications for selecting the right set screw. Get Catalog 23 from Set Screw & Mfg. Co., Bartlett, Ill., or Circle Inform-A-Gram No. G18.

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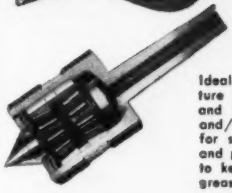
LIVE CENTERS

GUARANTEED TO MATCH OR EXCEED, "CRITICAL" JOB SPECIFICATIONS

In the GOLD BAND line Ideal has combined the latest production methods with their traditionally fine craftsmanship to bring you an unequalled standard of excellence in live centers. Accurate, (to ± .0001") GOLD BAND Live Centers offer "custom" quality at production prices. Specify GOLD BAND Live Centers and your every need can be accommodated from stock . . . 99 times out of 100. Ideal's GOLD BAND Live Centers offer savings, simplified operations and higher lathe output both in quantity and quality. Contact your distributor today...or



PRECISION FITTED BEARINGS

Ideal Live Centers feature precision machined and hardened ball and/or roller bearings for superior accuracy and performance. Sealed to keep dirt out, grease in.

A COMPLETE LINE FOR EVERY NEED...SPECIALS, TOO!

Send for

Complete catalog data and specifications.

IDEAL INDUSTRIES, Inc.

1334-A Park Ave., Sycamore, Ill.

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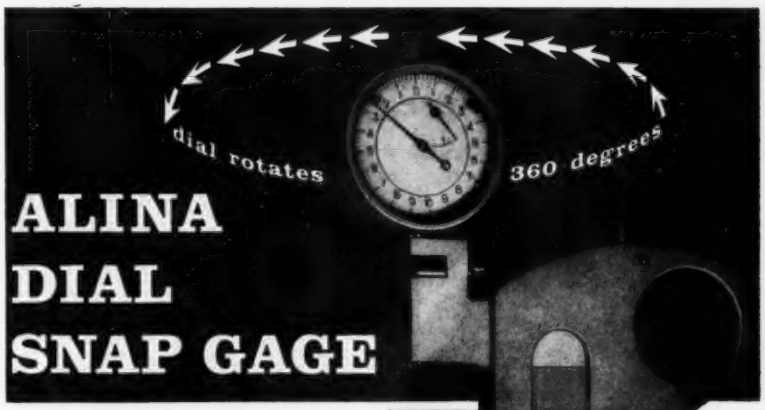
CIRCLE INFORM-A-GRAM KEY NO. 1071



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ALWAYS REPEATS

The No. HO 1 is ideal for rapid and accurate measurements of a wide variety of parts ranging in size from 0-1". It has a throat depth of 11/16" and the indicator may be *rotated thru 360°*.
The HO 1 may be used with either the right or left hand.
Both anvils are Tungsten Carbide to provide long and accurate on-the-job service.
Furnished in handsome hardwood case.

Model No. HO 1
Graduated .0001"

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122 East Second Street, Mineola, L. I., N. Y.

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BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Penna.

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Star Stainless screws have clean—bright and shiny—heads

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CORROSION RESISTANT

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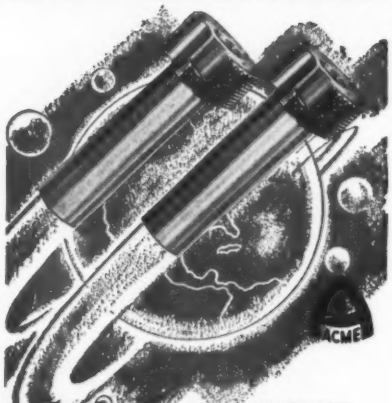
with
ACME



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PRECISION...AND FAST DELIVERY!

Send me your FREE drill bushing SELECTOR.
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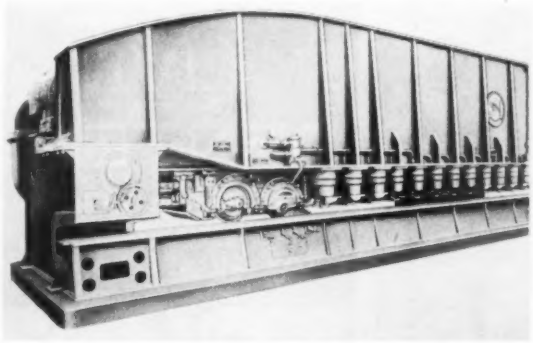
ACME INDUSTRIAL CO.
213 North Laflin St. • Chicago 7, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1083

Pressworking

PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS



This Heavy-Duty Roller Shear provides up to 1½" shearing capacity, 60" cutting length, and no more than 0.0125" deviation of a 40' long cut from a straight line. Plates are sheared between a lower blade and upper shearing roller, at 112'/min speeds. Cosa Corp., 405 Lexington Ave., New York 17, or Circle H1.

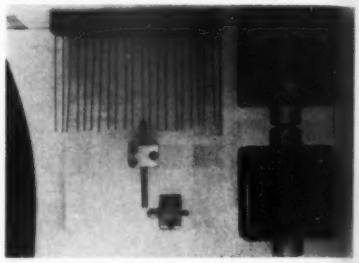
The Johnson Power Press Line is completely outlined in chart form in a catalog. Capacities and dimensions are given for flywheel, back-geared inclinable, and single- and double-crank straight-side presses. Ask for Catalog 1958-A from Johnson Machine & Press Corp., 620 W. Indiana Ave., Elkhart, Ind., or — Circle Inform-A-Gram No. H2.

Strippit Notching Units for notching sheet material up to ⅛" thick mild steel are shown in a catalog. It features the new standardized edge notching units which are being manufactured with stock punch

bodies, punch caps, and die holders. They can be made up for edge notching, radius or vee-notching, or special requirements. Get Catalog N from Wales-Strippit, Inc., 212 S. Buell Rd., Akron, N. Y., or Circle Inform-A-Gram No. H3.

A Metal Stamping Service is presented in a bulletin from Dayton Rogers Mfg. Co., Minneapolis 7. Shown are the different types of products that can be produced at their facilities. Write to the company for your copy, or Circle Inform-A-Gram No. H4.

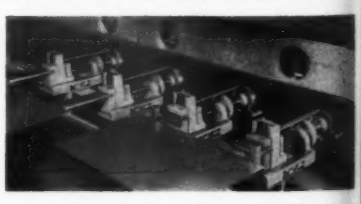
This Missing Parts Detector shuts off a power press when a stamped part fails to eject, thus preventing costly breakdowns and die damage.



Used in conjunction with the Circuit Master Mark III, the device provides buckling control, overload protection, end of material shut off, and misfeed control. Wintriss, Inc., 20 Vandam St., New York 13, or — Circle Inform-A-Gram No. H5.

A Slide Feed for more economical, automatic feeding of stock into punch presses is featured in a bulletin. The new models are simpler to set up and adjust and save change-over time. Other features and dimensions are given in the bulletin available from U. S. Tool Co., Inc., Ampere, N. J., or Circle Inform-A-Gram No. H6.

A New Press Brake Gage provides safer and faster setup and production. Horizontal adjustment is made by hand wheel at the rear; readings from 0" to 3½" are made on scale



on right side of the unit. Vertical adjustment is made by raising or lowering the front casting. Addresso Mfg. Co., 9105 W. King St., Franklin Park, Ill., or Circle Inform-A-Gram No. H7.

complete protection against dirt, grime and wear for any moving part with

ELASTICONE® COVERS

Plan ahead . . . specify Elasticones by size and number on your next drawing—get automatic protection for shafts, bushings, lead screws, guide pins or hydraulic rams—wherever precision and lubrication must be preserved.

Elasticones are spirally wound flat alloy steel cones available* in standard sizes for immediate delivery. Write for complete information and new data sheet '58.

CENTRAL Safety Equipment Co.

6603 Marsden Street Philadelphia 35, Pa.

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Specialized TOOLS
will help reduce your costs

TAP EXTRACTORS
Remove broken taps; no drilling; no delays; no damaged threads. Production range of sizes.

"Multi-Position" TOOL HOLDERS
Head adjustable to eight positions, including straight, right or left offset.

PIPE, STUD AND SCREW EXTRACTORS
Hardened steel makes strong, four-point, pulling grip. Will remove any material without reaming.

TAP EXTENSIONS
Fit standard taps (4, 3, 2 flute) from #10-(3/16") to 1".

Accept a "30 Day Free Trial" to prove in your shop that these inexpensive tools not only pay for themselves, but produce accumulating savings in time and labor that reduce costs. Write for DATA FOLDER #38.

SINCE 1908 WALTON TOOLS HARTFORD, CONN

THE WALTON COMPANY HARTFORD 10 CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 1092

You Need an Extra Hand Now to Speed Up Production!
HEIMANN TRANSFER SCREW SETS

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1093

The Inform-A-Gram card which follows page 86 is for your convenience in making inquiries about advertised Products and Editorial items.

Buy safe "SHUR-GRIP" drop forged HANDLES

Designed to hold 3 to 6 lb. lead hammer heads more firmly — will not slip — keeps hammer head in shape longer — makes re-molding easier, quicker, surer, less expensive.

Write for circular and prices

LAWRENCE H. COOK, INC.
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CIRCLE INFORM-A-GRAM KEY NO. 1094

SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand—sizes 3/32" to ½" by 1/64" plus hand 17/32" size—length 4⅞". PRICE only $17.90

Single size available.

R. L. SPELLMAN CO. • Urbana, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1095

NOW GET CLEAN SURFACED PARTS FROM YOUR AUTOMATICS . . . UNMARRED BY TOOL WITHDRAWAL MARKS

THE NEW RELIEVOMATIC SELF-RELIEVING TOOL HOLDER

SAVES YOU COSTLY SECONDARY FINISHING OPERATIONS

Avoid scratches like this

All clear with "Relievomatic!"

Easily installed on cross-slide or turret

Write today for details.

SILBER PRODUCTS, INC. Nightingale 9-8600

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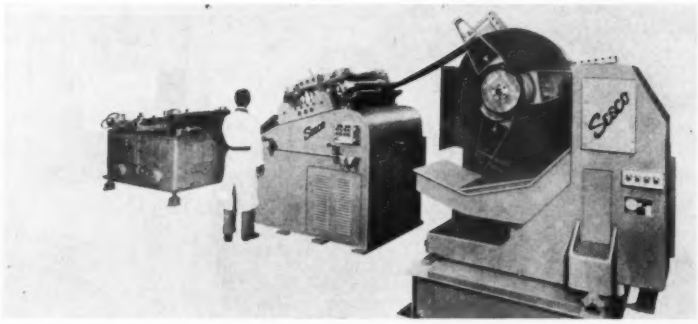
CIRCLE INFORM-A-GRAM KEY NO. 1096

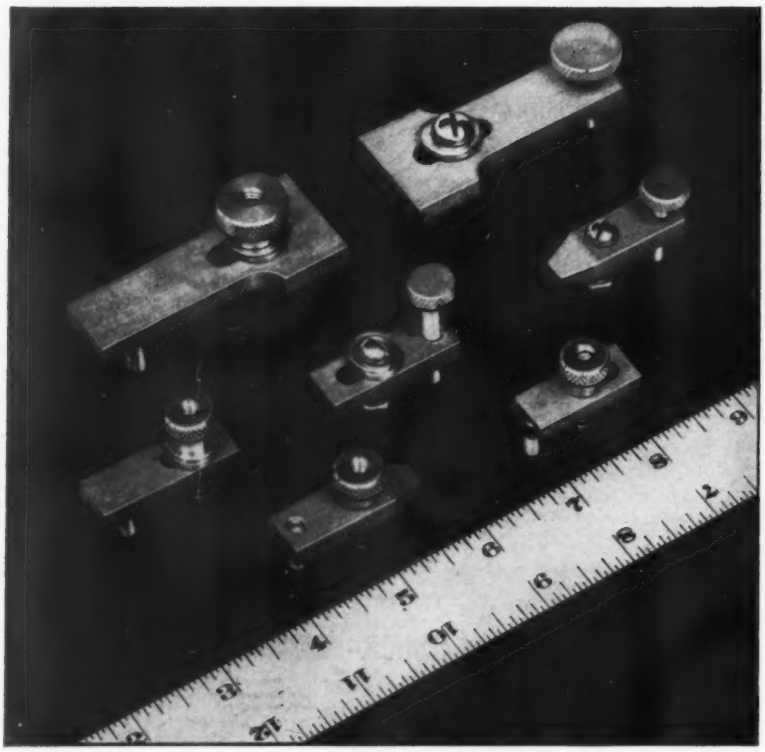
Pressworking

PRODUCTS & PROCESSES & PRODUCTS

This Push-Button Feed Line handles up to 40,000-lb, 72″ OD coils for direct feeding into blanking, piercing, forming, and progressive die operations. The compact, rugged line cuts costly downtime and speeds production, and is made up of a heavy-duty centering reel, power driven stock straightener, and double-gripper feeder. Get more information from Sesco, Inc., 8881 Central Ave., Detroit 4, or Circle Inform-A-Gram No. H8.



LODDING'S LITTLE FELLOWS



- **Non-magnetic - stainless steel type 303**
- **Tensile strength 90,000 p. s. i.**
- **Heat resistant - austenitic series (not affected by heat treatment with high resistance to scaling and distortion)**
- **Corrosion resistant (high resistance to many corrosives including acids)**

More than 85 details and 30 assemblies available immediately from stock

LODDING, INC.

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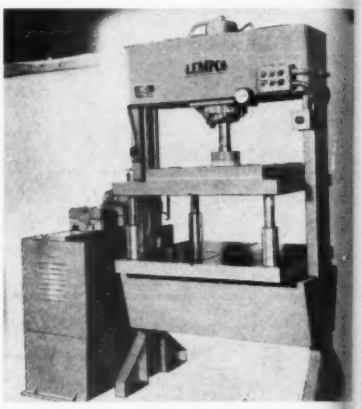
AMbassador 2-2273

CIRCLE INFORM-A-GRAM KEY NO. 1101

Hardened Steel Columns Roll rather than slide on the Lempco four-column hydraulic platen presses featuring pre-loaded ball bearing bushings. These bushings ride differentially with the column stroking in stationary hardened steel bushings pressed into the lower



platen. This increases accuracy, lessens preload, and reduces maintenance. Designed for plastic molding and metalworking, they're available with various accessories. Machine & Tool Div'n, Lempco Industrial, Inc., Bedford, O, or Circle Inform-A-Gram No. H9.

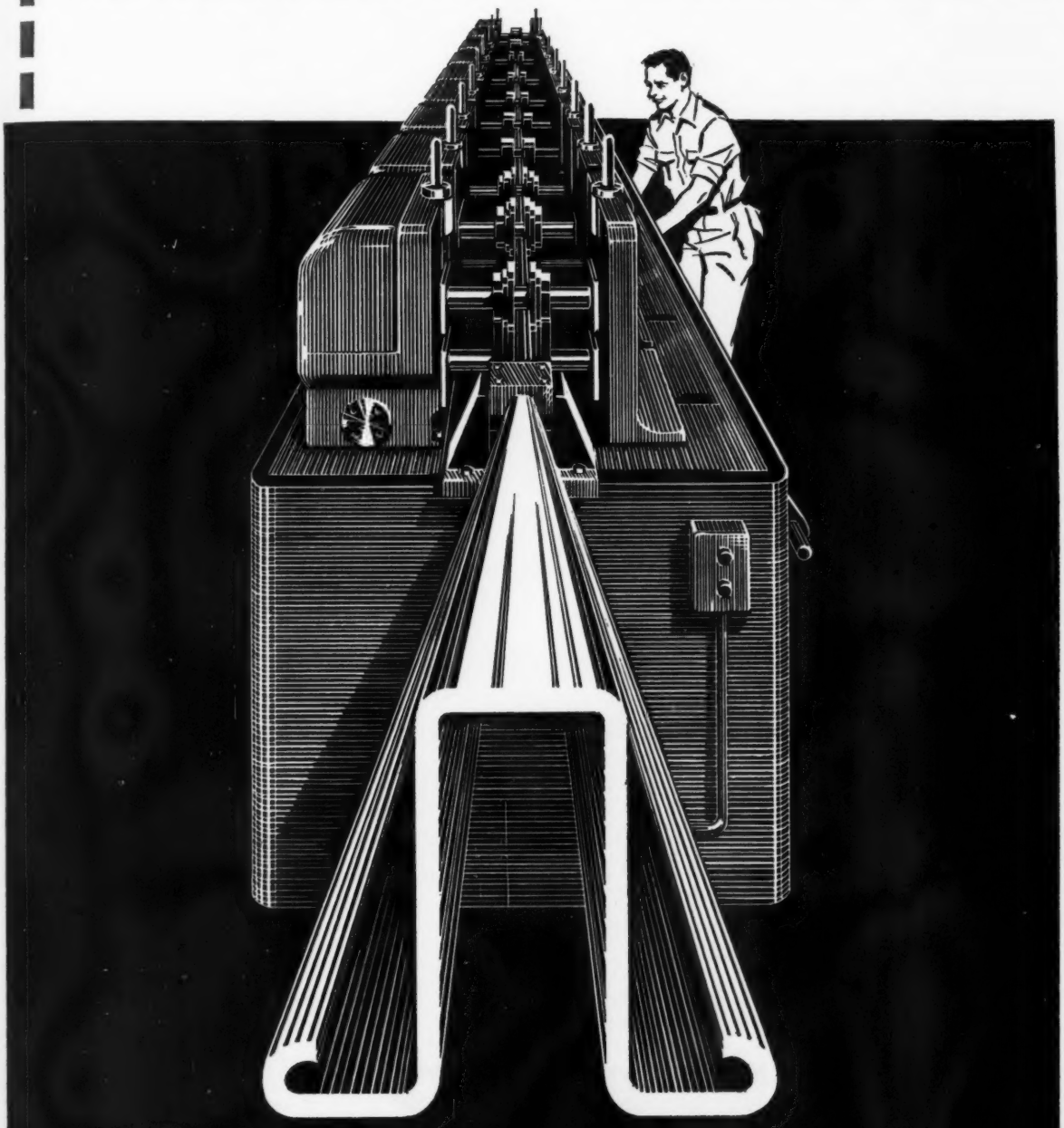
A Complete Line of Slitting Equipment for coil and sheet stock is presented in a bulletin. Recommended slitting procedures, including suggestions on coil handling, width of cut, and use of entry and delivery punch rolls, are given. Bulletin 44-A is available from E. W. Bliss Co., 1375 Raff Rd., S. W., Canton, O, or Circle Inform-A-Gram No. H10.

A Standard Line of Open-Gap and column-type high speed hydraulic presses that range from 1 to 150 tons, are covered in a bulletin. Features, specifications, and dimensions and a section containing engineering formulas for selecting the proper press, are included. Hanniffin Co., Dept. 164, 501 S. Wolf Rd., Des Plaines, Ill., prepares Bulletin 130-G, or Circle No. H11.

YODER

Roll Forming Equipment—Product dependability—integrity of manufacture—engineering for specific production needs have all contributed to establish Yoder equipment as the industry standard of excellence. Since 1909 Yoder-built machinery, including Pipe and Tube Mills, Roll Forming Equipment and Rotary Slitters, have earned world-wide customer satisfaction and recognition. Profit from Yoder's years of engineering and service experience. Send today for the illustrated Yoder Roll Forming Equipment Book.

THE YODER COMPANY • 5501 Walworth Avenue • Cleveland 2, Ohio



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COLD ROLL FORMING MACHINES

PIPE AND TUBE MILLS (ferrous or non-ferrous)

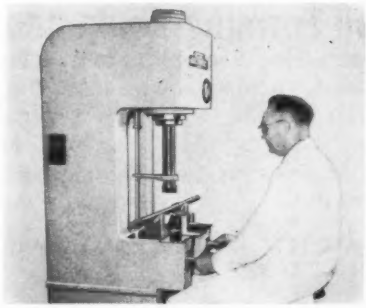
ROTARY SLITTING LINES

CIRCLE INFORM-A-GRAM KEY NO. 1111

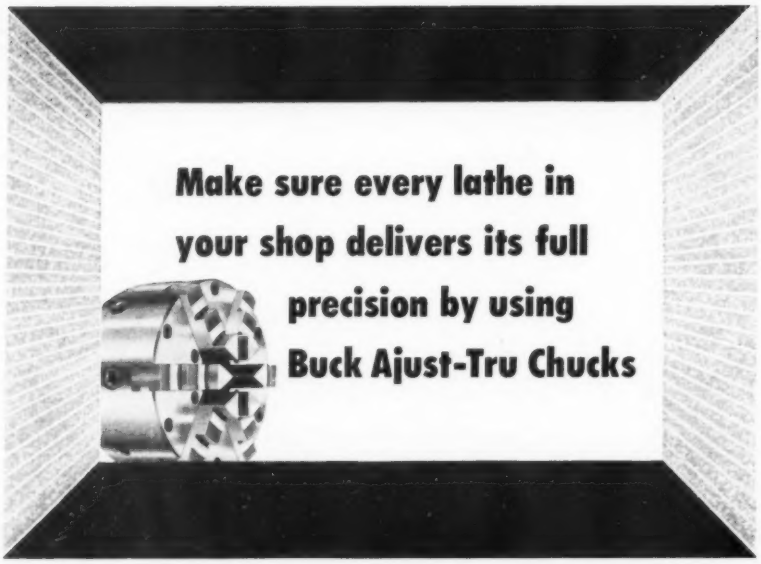
Pressworking

PRODUCTS & PROCESSES & PRODUCTS

Simplify Production Operations that require greater tonnage capacities with the new line of "E" Series Multipresses. The two- to eight-ton capacity bench models provide more daylight for wider tooling range and are ideal for assembly, crimping, forming, broaching, and trimming. Denison Engineering Div'n, American Brake Shoe Co., Columbus 16, Ohio, or Circle Inform-A-Gram No. H12.



GOOD buying habit



Sometimes it pays plenty to start new habits.
It does in specifying and ordering chucks.

Conventional scroll chucks *at best* guarantee only .003" accuracy *when new* – which falls off on wear.

Buck Ajust-Tru scroll chucks (2-3-and 6-jaw) guarantee *dead true* precision – guarantee *.0005"* chucking duplicate parts. The Buck adjusting principle greatly lengthens useful precision life. You get precision and many other features in Buck chucks *at conventional chuck prices.*

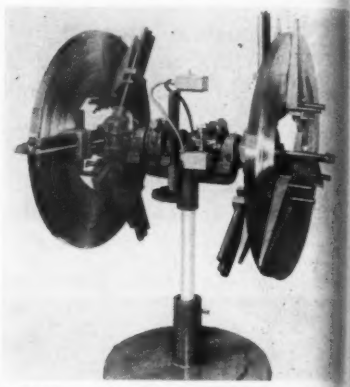
Start a good new habit today by sending for a catalog that shows why – "It pays to chuck with Buck."

Makers of Scroll, Power, Dust Proof, Independent Chucks,

BUCK TOOL COMPANY
118 SCHIPPERS LANE • KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1121

Increase Productivity using this double stock reel which can be loaded on one side while the reel on the other side is unwinding. Models take either two 500-lb 44" OD coils or



1,000-lb 48" OD coils. Descriptive data is available from Durant Tool Co., Thurbers Ave., Providence, R. I., or Circle No. H13.

Prevent Accidents and speed production with a Searjeant universal gate and enclosure press guard. If a hand or other obstruction is in the way, the guard cannot close and the press will not operate. A bulletin is available from Searjeant Metal Products, Inc., 37 Pittsford Rd., Mendon, N. Y., or Circle Inform-A-Gram No. H14.

A Versatile 15-Ton Power Press Brake is capable of forming, bending, punching, and blanking. Featured are laminated non-metallic ways that provide longer service life by

reducing wear. Get Bulletin 90 from Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y., or Circle Inform-A-Gram No. H15.

Four New Models of the C-Frame Press, including automatic, automatic with electrical controls, automatic with hydraulic interlock, and the same with electrical controls, are completely discussed in a bulletin. Application data and information on accessories are included. Get Bulletin 58CPA from The Hydraulic Press Mfg. Co., A Div'n of Koehring Co., Mt. Gilead, O., or Circle H16.

Any speed from 50 to 11,000 fpm with this Vastly Superior NEW BAND SAW by TANNEWITZ

Ideal for tool room sawing, trimming castings or friction sawing steel and other metals formed or flat . . . the most versatile, efficient and best built machine in the field. Note these new features:

1. **HEAVIER CONSTRUCTION** than any machine of its type — solid as a rock.
2. **MAXIMUM CAPACITY** . . . unobstructed from blade to column — 6" greater vertical clearance.
3. **EASIER BLADE TENSIONING** by remote control hand wheel on column.
4. **EASIER BLADE TRACKING ADJUSTMENT** with handily located lever and window.
5. **GRINDER AND WELDER** right where it is needed.
6. **AUTOMATIC HYDRAULIC AUTOMOBILE BRAKES ON ALL MODELS.**

These and dozens of other features that make it the greatest time and money saving metal cutting machine on the market. Write or phone for complete details.

THE TANNEWITZ WORKS, INC.
GRAND RAPIDS 2, MICH. • GL 6-1729

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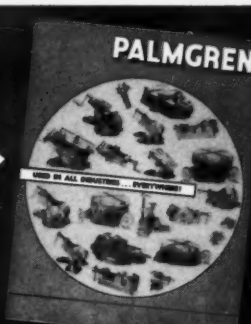
WRITE NOW FOR THIS **FREE CATALOG** ON WORK HOLDING TOOLS FOR PRODUCTION, TOOLING, MAINTENANCE

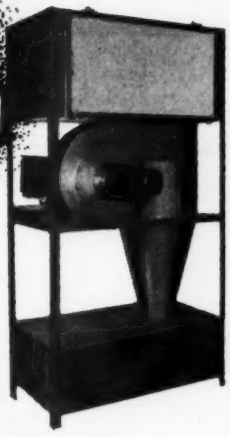


Drill press vises, angle vises, swivel machine vises, rotary tables, lathe milling attachments, production vises, heavy duty angle vises, and adjustable angle plates are illustrated and fully described in the New Palmgren Catalog. This is the only complete line of work holding devices available anywhere. Designed for production, tooling, and maintenance work, there are 68 different models and types to choose from. Vise jaw sizes are from 1½" to 8". Ask for your copy of this FREE Catalog No. 205 today. The complete line with details and prices are shown.

PALMGREN PRODUCTS
by CHICAGO TOOL AND ENGINEERING CO.
8388 SOUTH CHICAGO AVE. • CHICAGO 17, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1132

EFFICIENT–LOW COST Dust Collection



Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dustkop *FIRST* among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units, or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.

DUSTKOP® STOPS DUST

37 STANDARD MODELS TO CHOOSE FROM
• READY TO USE

Also a Complete Line of Mist Collectors

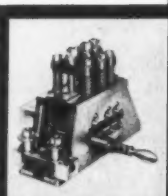
AGET MANUFACTURING COMPANY
1394 E. CHURCH ST. • ADRIAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1133

Buy DURANT

PRESS ROOM EQUIPMENT

STANDARD STOCK STRAIGHTENERS
Made in nine standard sizes to meet most requirements. Widths from 2" to 8"; roll combinations range from 5 to 9. Special sizes available to specific requirements.

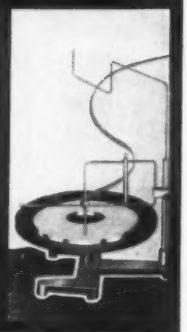


RAM SCRAP CHOPPER
Low cost, operated by press ram, independent of die. Easily bolted to press.

FOUR MODELS
M1 takes stock 3" wide .062 thick
M2 takes stock 6" wide .062 thick
M3 takes stock 10" wide .100 thick
M4 takes stock 12" wide .100 thick

AUTOMATIC STOCK REEL
Operates by natural spring of uncoiling stock. Platen turns on ball bearings. No motor, belts or sprockets. Loop of stock stops slippage, kick back, and over run. Speed limits controlled only by feed.

Write Now for new catalog showing prices and complete line of Equipment.



DURANT Tool Supply Co.
1-15 THURBERS AVENUE
PROVIDENCE 5, RHODE ISLAND

CIRCLE INFORM-A-GRAM KEY NO. 1141

NO BREAKAGE

PRODUCTO
UNIVERSAL
HAND TAPPER

For accurate hole-tapping without tap breakage, this Hand Tapping Machine is a "must" for every tool and die shop and toolroom. You can tap holes at any point in work within area of machine table. Quick-change spindles hold taps. Ready for instant use. Write for Bulletin TE4-102.

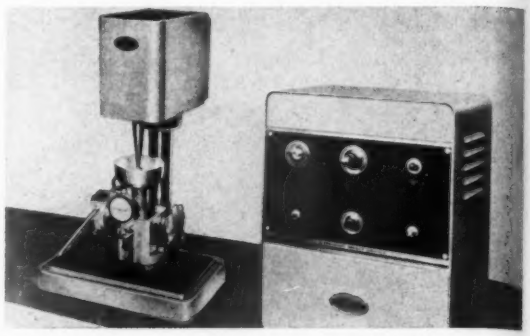
The Producto Machine Co.
970 Housatonic Avenue
Bridgeport 1, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 1142

Machining

PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

This Ultrasonic Impact Grinder uses a magnetostrictive transducer to permit a 100% duty cycle for cutting, slicing, drilling, grinding, and trepanning. Model 2-335 handles regular or irregular shapes of hard or brittle materials. Write to Raytheon Mfg. Co., Waltham 54, Mass., or Circle Inform-A Gram No. J1.

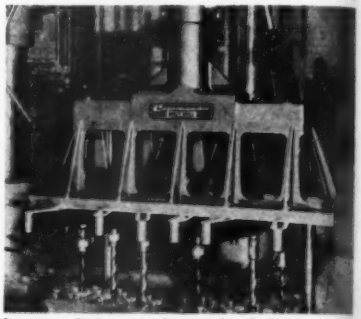


A Precision Universal Angle Vise, Model 1A, is one of the angle vises and plates offered in a bulletin. Production and job shop applications are illustrated for this line to help plan lower cost, compound angle precision setups for milling, drilling, planning, shaping, and grinding. Request copies from Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, or Circle No. J2.

Machine Vises, rotary tables, adjustable angle plates, standard setup fixtures, and the new Universal Clamp-N-Jack setup system for all

types of machine tools are described in a 24-page catalog. Catalog 9158CJ from Universal Vise & Tool Co., Parma, Mich., gives details or Circle No. J3.

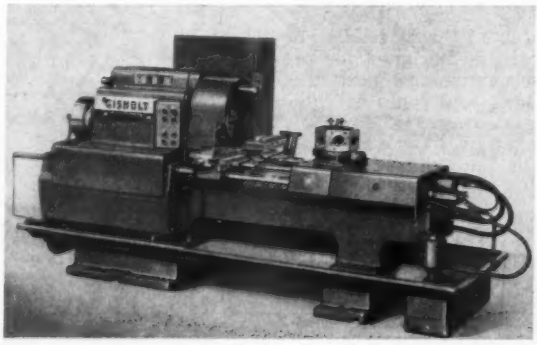
Mount This Multi-Drill on any drill press to drill or tap up to 15 holes in any pattern on a rectangular area from 3" x 22" or up to 35½". Model 3-22 has a ⅜" capacity in steel, and is equipped with universally adjustable locating arms,



heavy-duty universal joints, and anti-friction bearings. Commander Mfg. Co., 4225 W. Kinzie St., Chicago, or Circle J4.

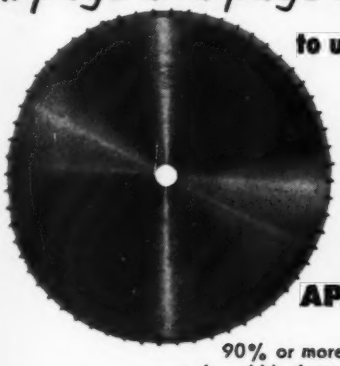
An Improved Automatic Recessing Tool has two cam follow pins that prevent binding and provide chatter-free operation and maintain concentricity. The holder is obtain-

able with eight adapters to accommodate four different cutting tool shank sizes. Get details from Seibert & Sons, Inc., Chenoa, Ill., or Circle Inform-A-Gram No. J5.



The New Fastermatic Automatic Turret Lathe has a selector-switch control panel that reduces setup time 50%. Rough and finish boring, reaming, rough and finish facing, and chamfering can be performed. A 21-page catalog is available from Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis., or Circle No. J6.

It pays and pays and pays...



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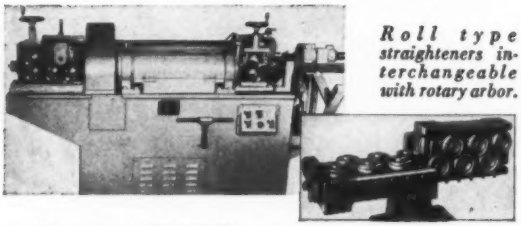

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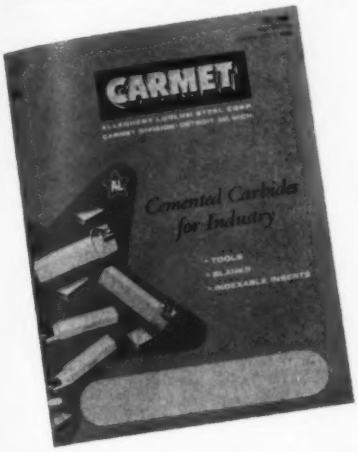
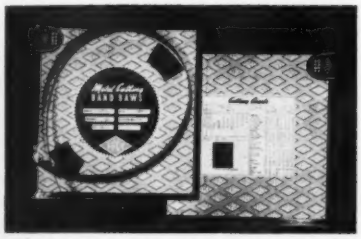


charts on proper feeds, speeds, and grades of carbide materials to use on various cutting operations are featured. Ask for Catalog C-16 from Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, or Circle Inform-A-Gram No. J7.

Bandsaw Blade Coil Stock comes in 100′ and 400′ lengths, in six widths from 3/16″ to 1″, and in nine pitches from 3 to 24 teeth/in. The line also



includes 1/4″, 3/8″, 1/2″, and 3/4″ strip tooth blades. For literature, write Boice-Crane Co., 963 W. Central Ave., Toledo 6, Ohio, or Circle Inform-A-Gram No. J8.

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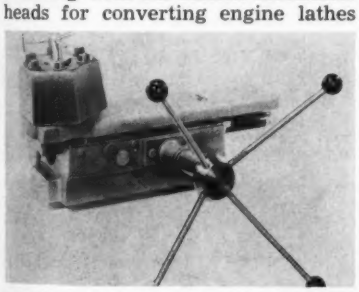

into ram-type turret lathes for production work requiring multiple machining operations. Precision Processing Co., 3269 Casitas Ave., Los Angeles 39, or Circle No. J9.

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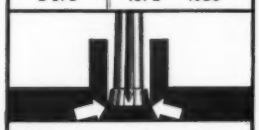

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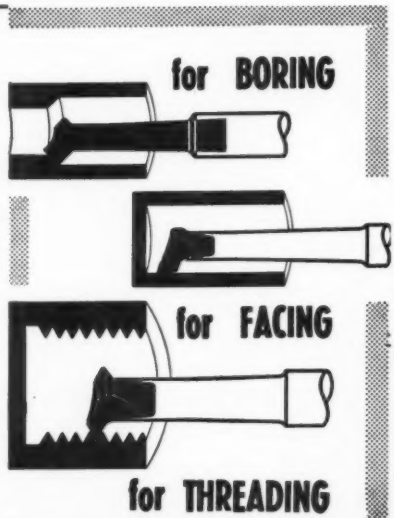

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"Carbide Tipped Shell End Mills" is a bulletin which gives dimensional and cutting angle data on three sizes of the Coromant S-26 shell end mill for square shoulder milling and low cutting pressures, and the S27 mill for heavy-duty face milling. Get a copy from Sandvik Steel, Inc., 1702 Nevins Rd., Fair Lawn, N. J., or — Circle No. J15.

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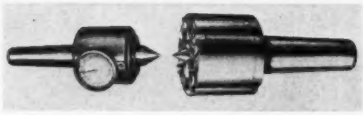

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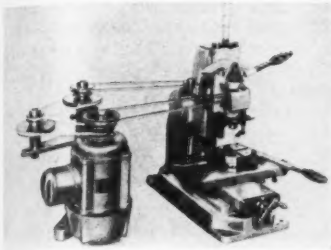

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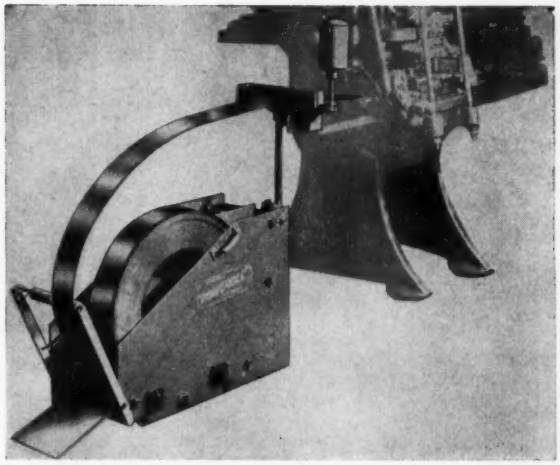

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Where all other types of tools and equipment had failed, a PRECISE Super-Speed POWER QUILL—mounted on a standard machine tool—solved an acute milling problem for the Delta Corporation, Hartford, Connecticut. The high speed and precision of a PRECISE Super 60 POWER QUILL easily maintained slot tolerances of .001" on a thin stainless steel jet component without sheet distortion.

PRECISE Super-Speed POWER QUILLS meet every production and toolroom requirement and are quickly mounted with PRECISE mounts on standard and special machine tools. They mill or grind the hardest alloy steel, soft plastic, wood and rubber, aluminum, Masonite and even glass. Their superhigh speeds, high torque, spindle and chuck rigidity permit the use of the hardest cutting tools for faster stock removal, improved surface finishes, maximum tool life, and the maintenance of tolerances to .0001". Adjustable spindle speeds range from 15000 rpm to 45000 rpm with power ratings up to 1½ hp from ordinary 110v or 220v power supplies.

Mail coupon below for complete information on the entire line of PRECISE Super-Speed MICRO TOOLS.

PRECISE PRODUCTS CORPORATION, Racine, Wisconsin, U. S. A.
Branch Plant: Precise, G. m. b. H., Duesseldorf, Germany

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Power Quills Grinder Millers Milling Machines Accessories
Rotary Cutting Tools Vapor-Lub Cooling Systems

PRECISE PRODUCTS CORPORATION, 3741 Blue River Road, Racine, Wisconsin
☐ Send complete information on Power Tools ☐ Have salesman call.
Also send data on ☐ Cutting Tools ☐ Vapor-Lub Cooling.

Name_____Title_____

Company_____

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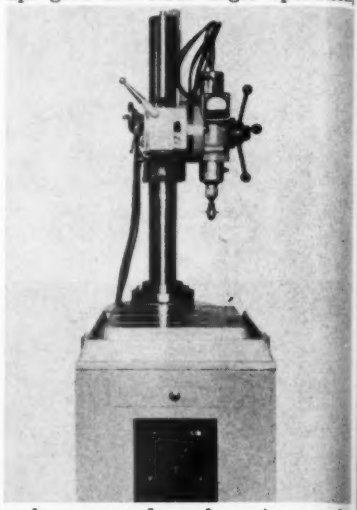
City_____Zone_____State_____

CIRCLE INFORM-A-GRAM KEY NO. 1221

Machining

PRODUCTS & PROCESSES & PRODUCTS

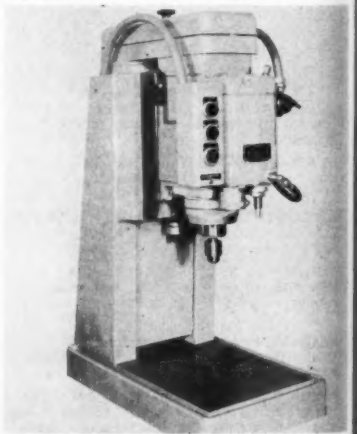
A Metal Disintegrator does arc drilling of all shaped holes in hardened steels, titanium, and stainless steel, and removes broken taps, drills, and reamers. Three 360° setups give universal angle operation,



and compound angle cuts can be made without pilot bushings and deep hole drilling. Ask for a bulletin on Model C-86 from The Cammann Mfg. Co., Inc., 2700 Henninger Rd., Cleveland 9, or Circle No. J19.

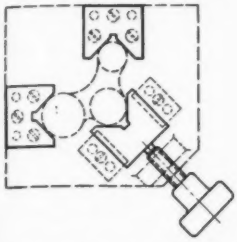
Seven Small Sizes of High Speed Straight-Shank Oil Hole Drills have been added to their line by Whitman & Barnes, Plymouth, Mich. The sizes are 3/8", 25/64", 13/32" 27/64", 15/32", 31/64". For additional information, write the company, or Circle Inform-A-Gram No. J20.

A Small Bench-Type Drilling Machine has been added to the standard machine components line of Hartford Special Machine Co., 287 Homestead Ave., Hartford, Conn. It's equipped with an air hydraulic drill



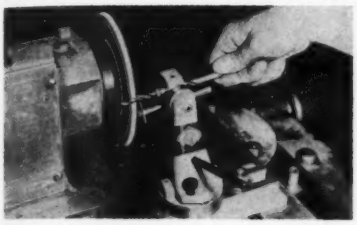
unit with 1½" total stroke, adjustable for length of quick advance, feed rate, and total depth. Get details from the company, or Circle Inform-A-Gram No. J21.

Locating or Clamping can be done with these V-pads announced by Northwestern Tools, Inc., 116 Hollier Ave., Dayton 3, Ohio. Shown are two V-pads used as solid locators



and one used as an adjustable clamp. Available in 1″, 2″, and 3″, they can be drilled, tapped, or counter bored. Write to the company for details, or Circle Inform-A-Gram No. J22.

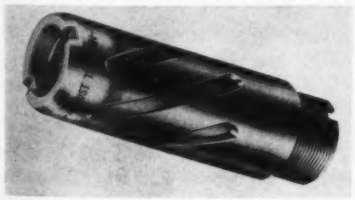
Grind Double Margins on drills, reamers, and Stepdrills with the Spira-Margin grinding fixture. It has a capacity for all letter, number, and fractional drills from 1/64″ through



½″ and the indexing accuracy is within 0.0005″. Steptool Corp., 3613 E. Olympic Blvd., Los Angeles 23, or Circle Inform-A-Gram No. J23.

An Extended Range of Disposable Carbide Inserts has been announced by the Metallurgical Products Dept., General Electric Co., 11177 E. 8 Mile Rd., Detroit. Nine sizes, in various grades, are precision-ground no-radius type. Inserts with special or non-standard radii are offered in increments 0.001″ to 0.125″. Get details from GE, or Circle Inform-A-Gram No. J24.

Loss of Tension in master pushers can now be eliminated with the new adjustable tension pushers. Prior to inserting the tube, the master pusher is screwed into the outer

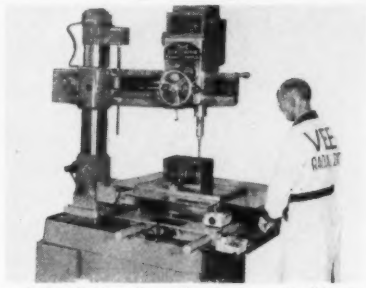


sleeve until the correct tension is obtained. The threaded outer sleeve permits easy tension adjustment in fine increments. Write to Balas Collet Mfg. Co., Cleveland 14, for literature, or Circle No. J25.

An Air-Operated Drill Jig has been announced by N. A. Woodworth Co., 1300 E. 9 Mile Rd., Detroit 20. The Wedge-lok and Air-lok units incorporate twin air cylinders built into the base casting which

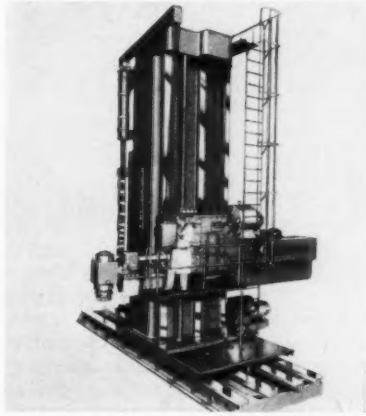
actuate the jig posts to raise and lower the bushing plate, and a control valve adjusts the speed of the bushing plate on the downstroke. Write the company for details, or Circle Inform-A-Gram No. J26.

Accurately Duplicate Parts without expensive jigs and fixtures with the combination precision spacer table on a 3′ Veet precision radial drill. Working directly from blue-



prints, hole locations are held to 0.001″ limits. Veet Industries, P. O. Box 306, E. Detroit, or Circle Inform-A-Gram No. J27.

These Horizontal Boring, drilling, and milling machines have spindle diameters of 8″ and 10″. They're capable of boring, turning, or facing over 12′ dia, developing 7½ hp/rev,



and can be furnished with most types of automatic controls. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., or Circle Inform-A-Gram No. J28.

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To meet your production or toolroom grinding, milling, or finishing operations, look to PRECISE as one source for all your HIGH RPM rotary cutting tool requirements. PRECISE Rotary Cutting Tools are available in H. S. Steel, Tantung, Carbide, Abrasives, and Diamond, in a complete range of sizes and shapes. They represent the highest in quality and performance for faster, more efficient metal removal and improved finishes.

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STUB DRILLS

The short, heavy duty flutes of Ace Stub Drills are ground into top quality pre-hardened high speed steel to give you keener cutting lips, extra strength, longer drill life. Ideal for close-to-work screw machine operations and portable drilling. And they're now stocked in 140 standard sizes that cost approximately 20% less than equivalent jobber length drills!

Call your local Ace Drill Distributor today!

NEW CATALOG covers the entire line of Ace "Ground-from-the-Solid" High Speed Steel and Carbide Drills, Reamers, Drill Blanks and Special Drills. Send for it today!

ACE DRILL

ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

CIRCLE INFORM-A-GRAM KEY NO. 1241

MANUFACTURING MEMOS

See It At Home . . . The DoAll Company's bringing its "Tooling for Competition" program into the "back yards" of engineering, production, and management people with a mobile demonstration unit. DoAll's pitch is to replace obsolete machine tools, and they figure that the best way for management to keep up on new developments is to show them on the spot. A Contour-matic band machine, power saw, surface grinder, and precision measuring instruments "show off" right outside your office. Get on the schedule by writing the company in Des Plaines, Ill.

What's New . . . and old too, in welding can be found at the Information Center established by the American Welding Society. Many facts and figures on the welding industry and its processes can be found here. However, individual companies handle info on specific products, equipment, and personnel. So if you want the facts, write AWS at 33 W. 38th St., New York 18.

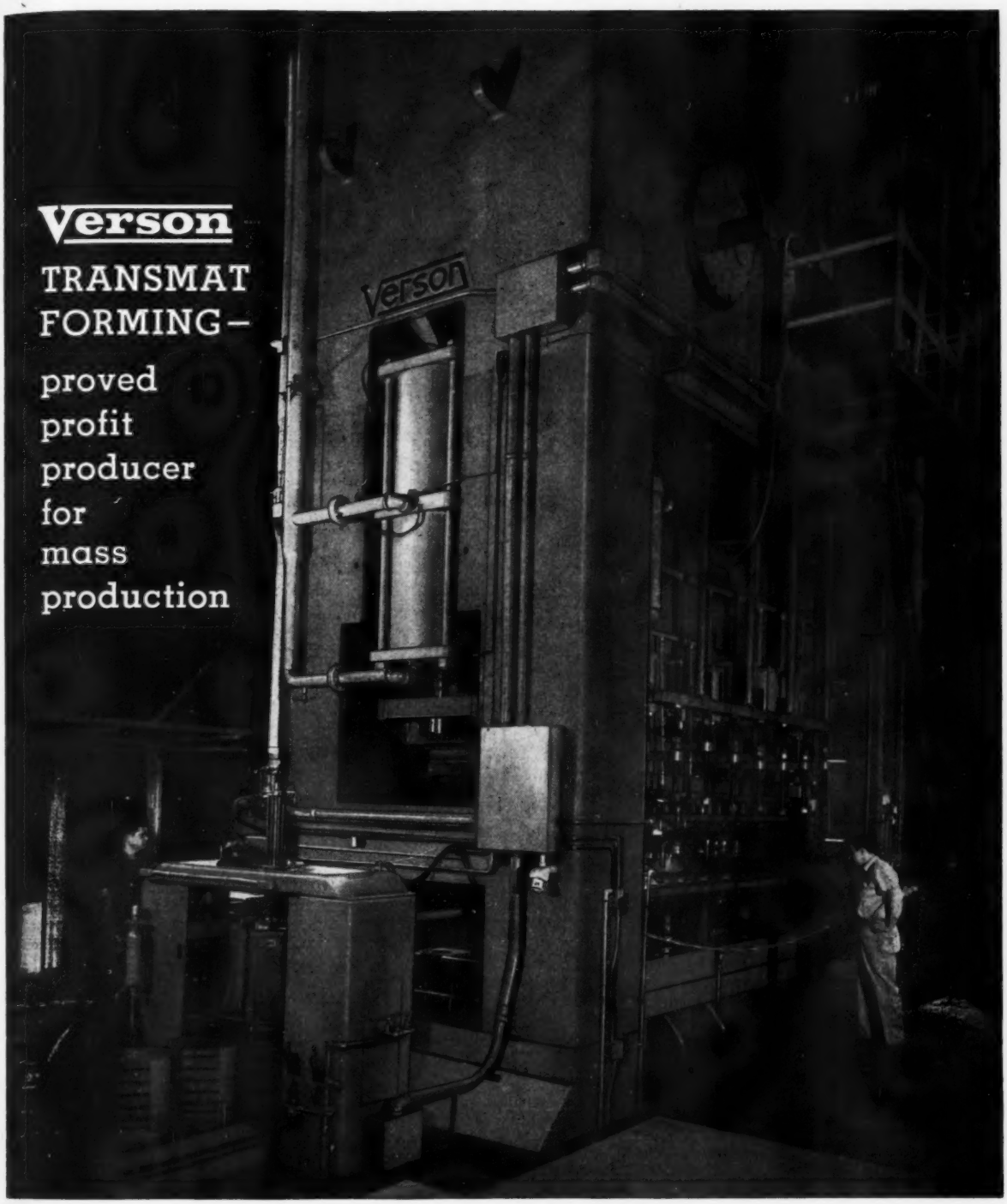
No Yearlings Here . . . The Chicago Screw Company's age is not 16,000 years, but that's almost the total number of years stacked up by the company's employees. Chicago Screw must have a good group because 65% of them have been with the company a minimum of 15 years. Two have been there 45 years and one old timer for 48 years.

Business Booster . . . Off on a magic carpet to India for some international relations boosting recently was Herbert Harig, Harig Mfg. Corp.'s prexy. As a tool and die specialist, he was one of a six-man trade mission that toured the country, lending an ear to business problems and exchanging ideas. The team ended the trip at the U. S. Sole Exhibit in New Dehli.

There's a Hex on Squares . . . It's just a matter of fastener simplification says Russell, Burdsall & Ward Bolt & Nut Co. The common square-headed bolt and square nut may go out the window because the new combination of one hex bolt and hex nut makes for faster assembly and simplified stocking.

Wear Surface Solution . . . A new idea for manufacturers of instruments and gages who use tungsten carbide for wear surfaces has been announced by Ram Meter, Inc. They've developed a process of copper plating tungsten carbide so that the carbide piece can be held in place with ordinary low temperature soft solder. Warping, cracking, and unstability can be eliminated this way, they say. Details can be had from the company, 1100 Hilton Rd., Detroit 20.

Abrasive Group . . . Foremost goal of the new American Society for Abrasives is to unite and help industry through discussions and information on new ideas and methods. Ted J. O'Connell of Mackin Co. is national chairman, and John Y. Arnold of The Carpenter Steel Co. is president. The ASA office is at 222 Berks County Trust Bldg., Reading, Pa.



If the squeeze on profits is hurting you, it is time to consider Verson Transmat Forming for any stampings you must produce in quantity. For twenty years the Verson Transmat Process has been proving itself a real profit builder on stampings of virtually all sizes and shapes.

This press at Kelsey-Hayes Company is a good example of what Transmat forming can do. It produces complete automobile wheel spiders in seven operations without intermediate handling, pickling or annealing. Operating speed is 18 strokes per minute, with a finished spider discharged at each stroke.

Talk over your quantity stamping requirements with Verson engineers. Their cost conscious approach to your problems pays off in better returns to you. Write or phone, today.

VERSON ALLSTEEL PRESS CO.

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Mechanical and Hydraulic Presses and Press Brakes • Tooling
Die Cushions • Verson-Wheelon Hydraulic Presses

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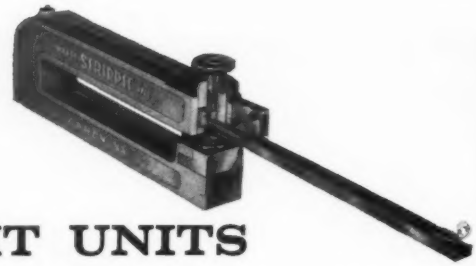
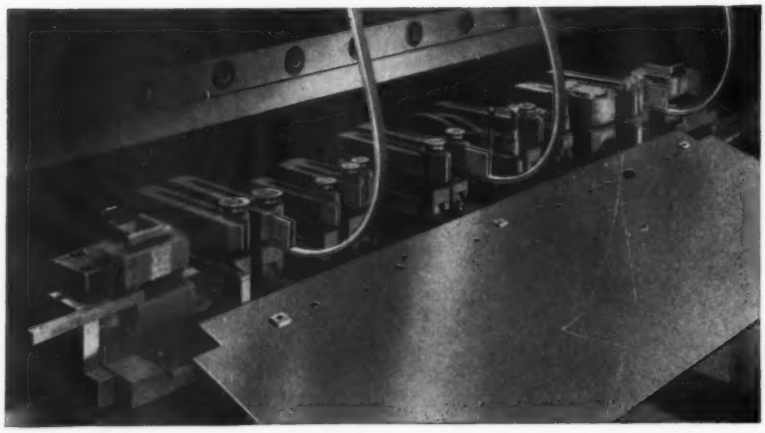


NEW STRIPPIT UNITS

. . . stake nuts permanently with every press stroke!



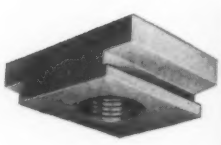
STRIPPIT PIERCE NUT UNITS save operations, time and money in assembly panel production with single-stroke insertion of Fabristeel Multipierce Nuts* into sheet metal up to .125" thick.

Permanent Fastening by an Exclusive New Process—as nut pierces stock, metal flows into nut shoulder slot, becoming an integral part of the stock.

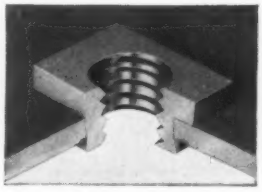
High-Speed—fast press setups, automatic feed of nuts to units for long, medium or short runs gets maximum production per press.

Flexibility—Pierce Nut Units can be quickly press-mounted in any desired pattern, changed on short notice, re-used over and over.

*A Product of Fabristeel Products, Inc.



Each nut is its own punch, a new one each time



Die button causes material to flow into nut slot

Simultaneous embossing for flush fastening

WRITE FOR DEMONSTRATION on your press! The speed and simplicity of Strippit Pierce Nut operation has to be seen to be believed. Also request new catalog for complete specifications.

WALES STRIPPIT INC.

A UNIT OF HOUDAILLE INDUSTRIES, INC.

212 Buell Road, Akron, New York

In Canada: Strippit Tool & Machine Company, Brampton, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 1261

MANUFACTURING MEMOS

Testing Award

Republic Steel received the De Forest Award, sponsored jointly by the Society of Nondestructive Testing and Magnaflux Corp. It's given annually for outstanding contributions in the nondestructive testing field.

Turn Those Wheels

Good ideas on machine efficiency and economy will win in the machine design award program sponsored by The James F. Lincoln Arc Welding Foundation. Fifty-four prizes will be handed out for best papers on uses and advantages of arc welding in the design and construction of machines or machine components. Get info from the secretary of the foundation, P. O. Box 3025, Cleveland 17.

Three Name Sign

The Ramo-Wooldridge Corp. has merged with Thompson Products, Inc., and takes the name of Thompson Ramo Wooldridge Inc. R-W was formerly an affiliate of Thompson.

Component Baby

Now producing complex precision metal parts for the mother company, Standard Pressed Steel, is the new Nuclear Components Division.

Acquires New Line

A wider range of the field is now being covered by Black & Webster, Inc., following the acquisition of Edward Blake Co., Inc. B&W's added Blake's line of precision tap and drill grinders to its line of assembling and fastening products. All design, manufacturing, and sales rights for Packmaster automatic packaging machinery have been taken over by Sundstrand Machine Tool Co. This machinery will be built and sold through Sundstrand's American Broach Division.

Happy Birthday

A quarter of a century of business was celebrated recently by The Klaas Machine & Mfg. Co., Cleveland.

Same Testing

American Standards Assoc. has announced the formation of another committee by International Organization for Standardization. It's for coordination of mechanical test methods used in international standardization of metals and metal products.

SAVE THIS AD FOR FUTURE REQUIREMENTS—DEALER INQUIRIES INVITED

NEW SIZES ADDED DAILY . . . IF NOT LISTED HEREIN — INQUIRE

WHY WAIT

DELIVERY FROM STOCK

SPECIAL Right & Left Hand High Speed Taps-Dies & Thread Plug Gages

SIZE	THREADS PER INCH
0000	160
000	120
00	90-96-112
0	56-64-72
1	56-60-80
2	60-72-80
3	36-40-60-64-72-80
4	30-32-38-42-44-56-60-64-72-80-90
5	22-27-30-32-36-38-42-48-50-56-60-64-72-80
6	24-28-30-36-38-42-44-48-56-60-64-72-80
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.107	52
7/64	36-40-42-44-48-50-56
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.132	50
9/64	30-32-38-40
.148	38
5/32	24-26-28-30-32-36-38-40-50
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.198	24
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.227	24
15/64	20-22-24-28-36-40
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.277	40
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19/64	18-24
.300	28
5/16	12-14-16-20-22-26-27-28-30-32-36-40-48-50-56-64
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.365	28
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.402	24
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.800	16
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.835	16
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.850	14
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1.7715	12
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1-7/8	5-8-10-12-14-16-18-20-24-32
1-29/32	18-32
1-15/16	8-10-12-14-16-18-20-24-32
2	4½-6-8-10-12-14-16-18-20-24-28-32
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2-1/8	4½-8-10-12-14-16-18-20
2-3/16	8-10-12-14-16-18-20-24
2-1/4	4½-8-10-12-14-16-18-20-24
2-5/16	8-10-12-14-16-18-20-24
2-3/8	4-8-10-12-14-16-18-20-32
2-7/16	8-10-12-14-16-18-20
2-1/2	4-6-8-10-12-14-16-18-20
2-9/16	8-10-12-14-16-18-20
2-5/8	4-8-10-12-14-16-20
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2-3/4	4-8-10-12-14-16-18-20-32
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3-1/8	4-8-10-12-14-16-20
3-3/16	4-8-10-12-14-16-20
3-1/4	4-8-10-11-12-14-16-18-20
3-3/8	4-8-10-12-16
3-1/2	4-8-10-12-16
3-3/4	4-8-10-12-16
4	4-8-10-12-16
4-1/8	4-8-10-12-16
4-1/4	4-8-10-12-16

Many more sizes in stock up to 6" dia.

LEFT HAND N.C. (USS)—N.F. (SAE) SIZES

SEE ABOVE SECTION FOR MORE SIZES

SIZE	THREADS	SIZE	THREADS	SIZE	THREADS	SIZE	THREADS
0	80	8	32-36	7/16	14-20	1"	8-12-14
1	64-72	10	24-32	1/2	13-20	1-1/8	7-12
2	56-64	12	24-28	9/16	12-18	1-1/4	7-12
3	48-56	14	20-24	5/8	11-18	1-5/16	6-12
4	36-40-48	1/4	20-28	11/16	11-16	1-3/8	6-12
5	40-44	5/16	18-24	3/4	10-16	1-7/16	6-12
6	32-40	3/8	16-24	7/8	9-14	1-1/2	6-12

'OVERSIZE' and 'UNDERSIZE' TAPS

RIGHT AND LEFT HAND N.C. AND N.F. SIZES

MACHINE SCREW	#2 to #5	Plus or Minus	.003, .005, .010
MACHINE SCREW	#6 to #14	Plus or Minus	.002, .003, .005
FRACTIONAL	1/4" to 1-1/2"	Plus or Minus	.003, .005, .010 .015, 1/64, 1/32

Right & Left Hand—Unlisted 'Gun' or Spiral Pointed Taps

Size	Threads	Size	Threads
0	80 NF		
1	56 NS	7/8	9 NC, 14 NF
2	56 NC, 64 NF	1	8 NC, 12-14 NF
9/16	12 NC, 18 NF	1-1/8	7 NC, 12 NF
5/8	11 NC, 18 NF	1-1/4	7 NC, 12 N
11/16	11 NS, 16 NS	1-3/8	6 NC, 12 NF
3/4	10 NC, 16 NF	1-1/2	6 NC, 12 NF

Right Hand—Unlisted 'Pulley' And Extra Length Taps

Size	Threads	Size	Threads
4	36-40 NC, 48 NF	3/8	24 NF
5	40 NC, 44 NF	7/16	20 NF
6	32 NC, 40 NF	1/2	20 NF
8	32 NC, 36 NF	9/16	12 NC
10	24 NC, 32 NF	9/16	18 NF
12	24 NC, 28 NF	5/8	18 NF
1/4	28 NF	3/4	16NF
5/16	24 NF	Also Larger Sizes	NC & N'

UNLISTED Right Hand "Pipe" Taps

"NPT" Taper "NPT" Size	Thread	"NPS" Size	Thread	EX. LENGTHS "NPT" & "NPS" Size	Thread
1/16	27	1/16	27	1	8
1/4	27	1-1/4	11½	1-1/2	11½
2-1/2	8	2	11½	1/16	27
3	8	2-1/2	8	1/8	27
3-1/2	8	3	8	1/4	18
4	8	3-1/2	8	3/8	18
Also British		4	8	1/2	14
		Also British		3/4	14
				1	11½
				Also British	

Lefthand 'Pipe Taps' Taper and Straight

Size	Thread	Size	Thread
1/16	27	1	11½
1/8	27	1-1/4	11½
1/4	18	1-1/2	11½
3/8	18	2	11½
1/2	14	2-1/2	8
3/4	14	3	8
Also British		Also British	

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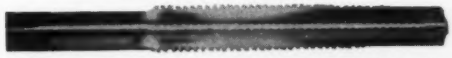

IF NOT IN STOCK—7 to 10 DAYS DELIVERY—When ordering or requesting quotations, kindly furnish following information:

(a) Kind of material being machined.
(b) Depth of hole, through or bottom.
(c) Tap to be used horizontally or vertically.
(d) Will tap turn, or is piece expected to be turned.
(e) Is tapping job expected to be done in one pass.
(f) Would tap be backed out of hole, or machine stopped for release of tap.
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Jan. 26-27. The Gear and Gear Lubrication Committee of the American Society of Lubrication Engineers' first Gear Symposium. Morrison Hotel, Chicago.

Jan. 26-29. Plant Maintenance & Engineering Show and Conference, Public Auditorium, Cleveland.

Jan. 27-30. Society of Plastics Engineers' 15th Annual Technical Conference, Hotel Commodore, New York.

Jan. 28-29. Armour Research Foundation of Illinois Institute of Technology and Chicago Section of American Welding Society's 5th Annual Midwest Welding Conference. Illinois Tech, Chicago.

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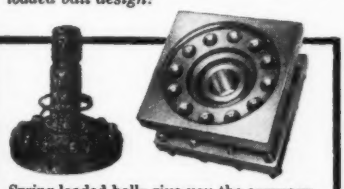

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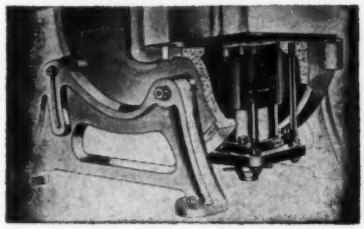

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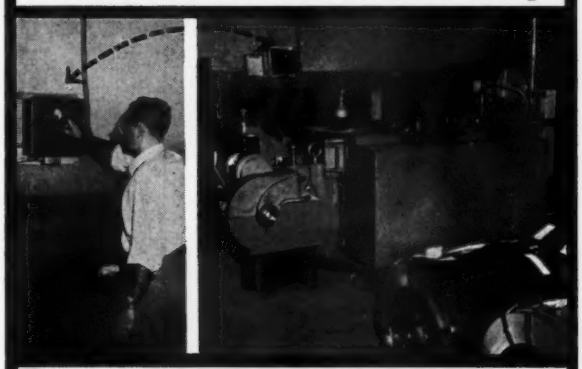

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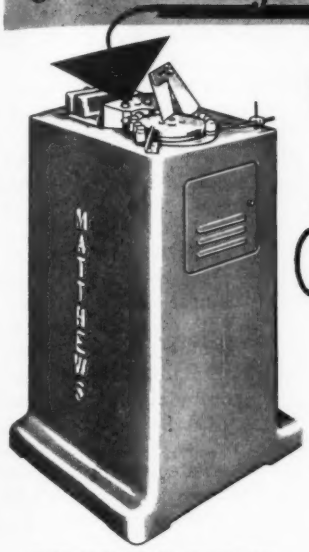

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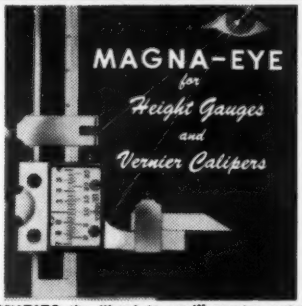

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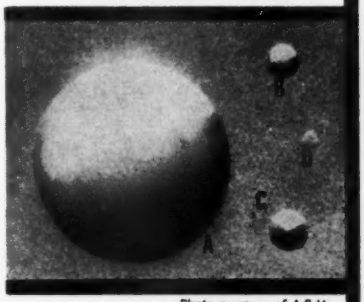

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Photograph illustrates the comparative size of impressions made by four different types of hardness tests:

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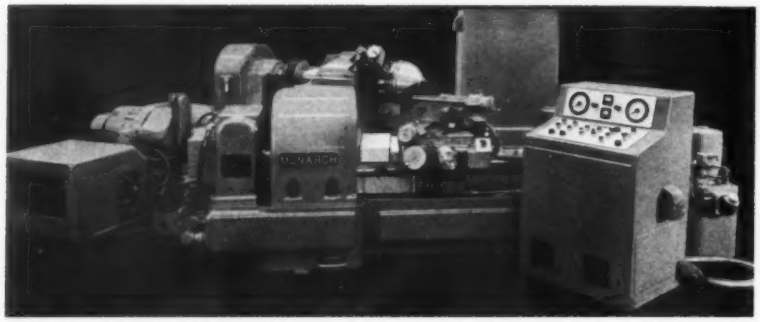

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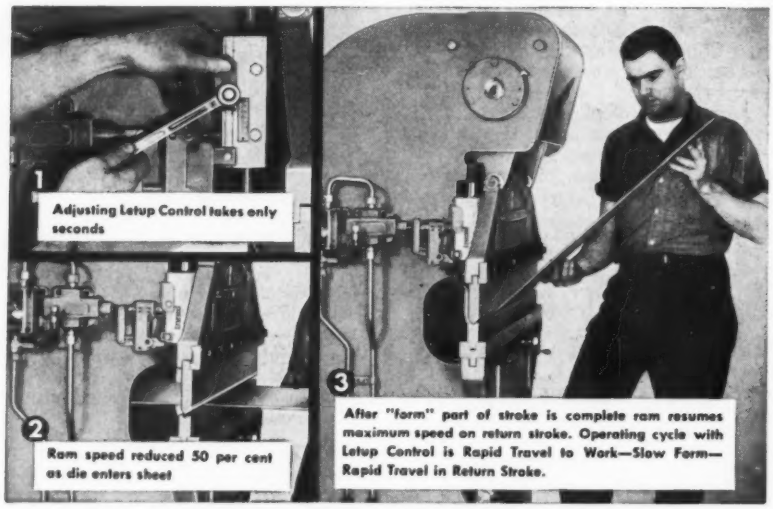
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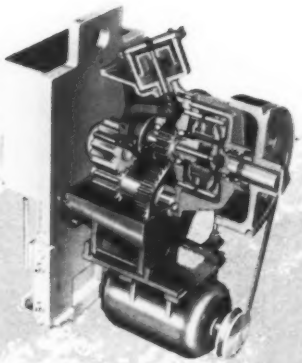

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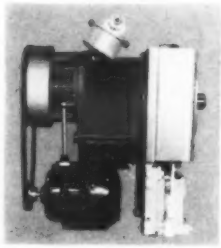

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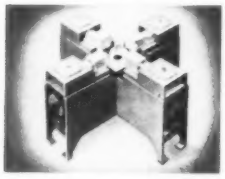

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